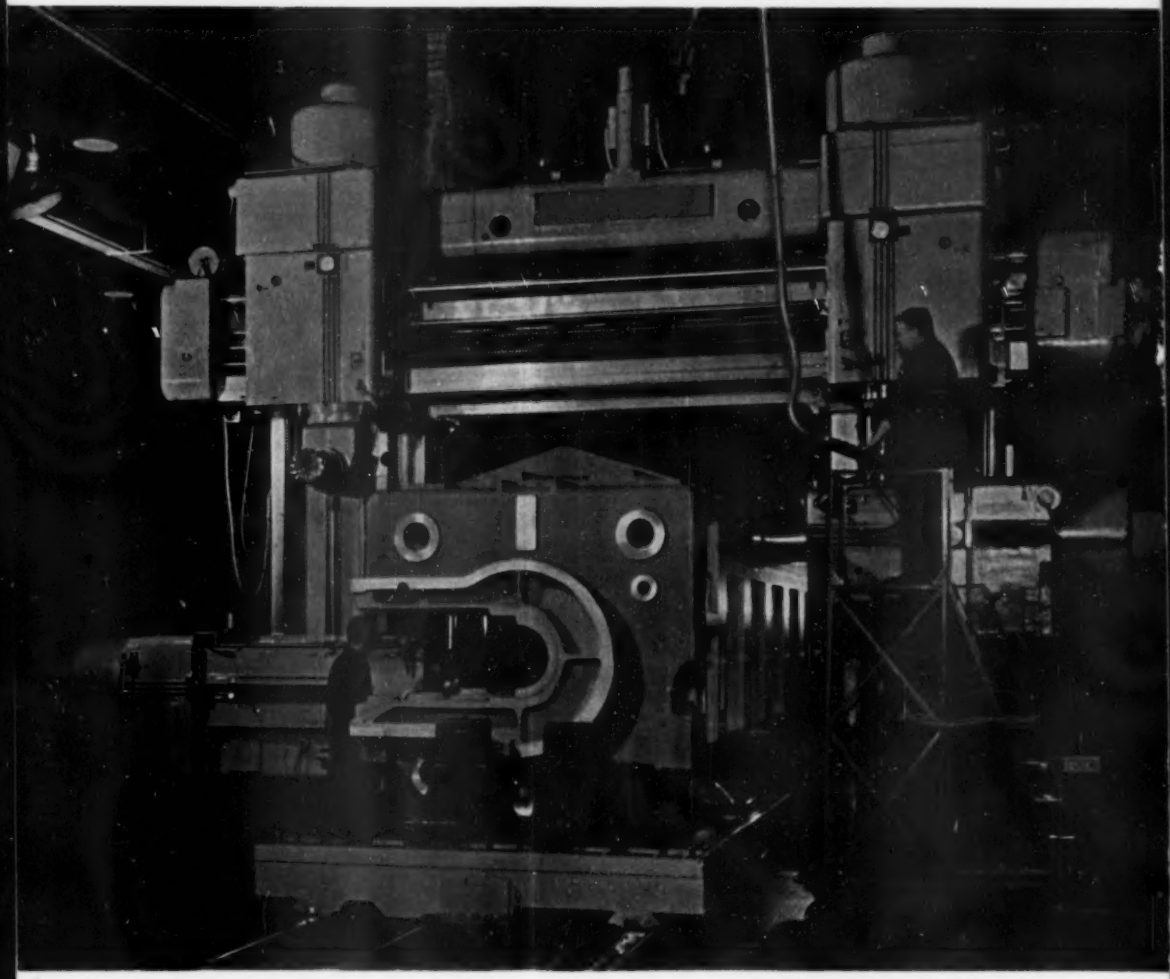
PRICE 50 CENTS

DECEMBER 8, 1952

American Machinist

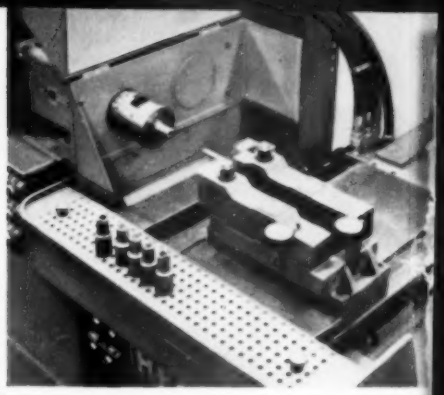
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

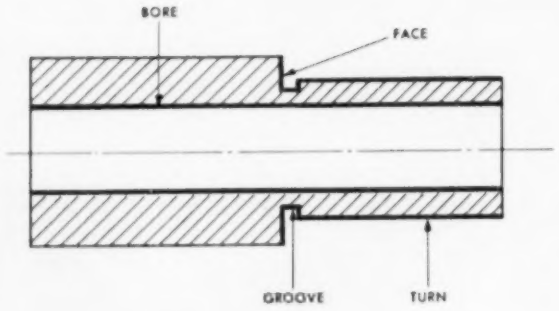


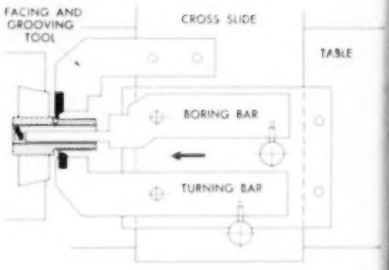
Milling a 30-ton diesel mainframe — see page 2

Latest Press Automation • Low-Cost Die Making

pinion blanks
bored – turned – grooved – faced
at 62 PARTS PER HOUR!

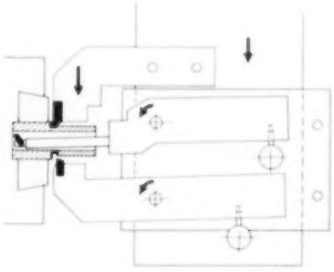






SIMULTANEOUS BORE AND TURN

After part is loaded, table rapid traverses to left and slows to bore and turn simultaneously to positive stop.



SIMULTANEOUS FACE AND GROOVE

At end of boring and turning stroke, cross slide indexes forward, retracts boring and turning tools .010" away from work and brings facing and grooving tool to operate on work – then resets to a point which leaves all tools clear of the work surfaces, thus eliminating any drag line as the table runs out to rest.

Heald Model 221 Bore-Matic performs four separate operations in one high-speed automatic cycle.

● When you can precision finish four separate surfaces in less than a minute – loading time included – that's real production efficiency!

The Heald Model 221 Bore-Matic shown above does just that – with a capacity of 496 parts per eight-hour day. What's more, the machine includes provision for future addition of a second work station, which could nearly double this figure.

Tooling consists of two dial bars for the boring and turning tools, plus a tool block mounted on the cross slide for the facing and grooving operations. Boring bars are retracted after borizing to eliminate drag line. Work is held in a quick loading collet chuck.

The entire operation – boring, turning, grooving and facing – is accomplished in a single, fully automatic high speed cycle, as shown at the right.

Remember – when it comes to precision finishing, it pays to come to Heald.

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INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

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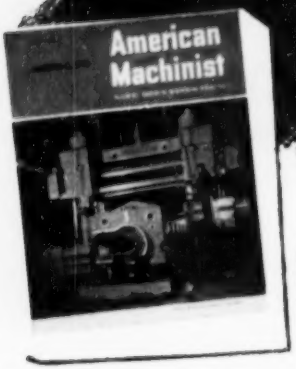


Clips

Four Heads . . . Our cover picture shows an Ingersoll four-head miller working on a 30-ton main-frame casting for a big type GMW diesel engine at the Cooper-Bessemer plant in Mount Vernon, Ohio. James Israel of that city was the photographer, and an excellent job he made of it. The picture has appeared in print once before—in the CB Annual Report, where is was admired by 9000 stockholders.

Press Automation . . . As long as Ford keeps on leaping ahead in automation and you remain so much interested, we'll probably keep on telling you about the latest steps. Associate Editor Rowan takes 10 pages in this issue to pick out the different devices at the new Buffalo stamping plant. These are considerably changed from those described four years ago (*AM*—Oct 21 '48, p 107) when the first story anywhere on automation appeared in our pages. Designs are now smaller, simpler, more flexible, easier to maintain—and this plant was built from the ground up to capitalize on automation. "Mike" Rowan shows loaders, extractors, turnovers, die design, plant layout, handling, scrap disposal, and new under-drive presses in a plant that gobbles up 1800 tons of steel each 2-shift day—and without human effort.

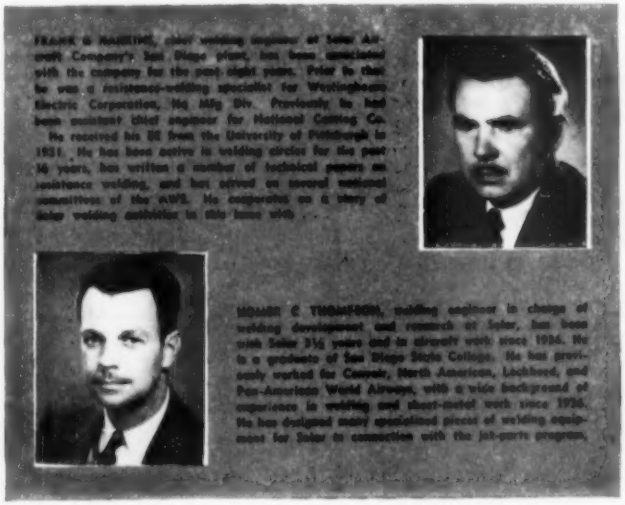
Roving Editor . . . Our globe-trotting chief editor gives his inside analysis of the German machine-tool industry in four fact-packed pages in this issue. We add in another article some examples of machine tools at the Leipzig Fair. They include Russian, East German, and Chinese machine tools.

Master Gears . . . Fred Bohle of Illinois Tool has done a masterful job on master gears. We give it to you here as a 6-page foldout insert. It includes an explanation and a chart.

Sunnyvale . . . The California plant of Westinghouse makes this issue with two stories, one of which has just been missing print for some weeks because of our rash of "hot" stories on new developments. That one is on making rollers and tracks for the gates on Garrison Dam, recently dedicated during a Truman whistle-stop tour. The parts are tough stainless, the story is in pictures, and includes a special force-cooled drill . . . The other story describes how elliptical holes were made within the truss-like structure of the spar that supports optical elements of a coronagraph. The holes must be true, must hold the 7° angle exactly enough so a light beam 7 in. in dia stays in the center of the optical system. It's not boring, but about it.

Space . . . Joseph Wiltrakis of Western Electric (Kearny, NJ) asks, "Are You Using Your Space Effectively?" He goes on to give a quick method of analyzing space utilization to check on the need for introducing improved materials-handling procedure, gives a formula for space estimating, and offers the "Areagram" for graphing space utilization. . . . There are also shorts on fiber ducts for machine tools and on safety methods at Chain Belt.

Coming . . . Issues change in editorial content so rapidly these days that we're afraid to predict what'll be in 'em even two weeks in advance. We'll guess, however, that *AM* for Dec 22 will include a Special Report about noise—a real problem—plus stories on machining toxic beryllium-metal parts at Oak Ridge, something on automatizing die casting, on welding pails, on converting a spotwelder, on molybdenum disulphide as a coolant, on aiding the handicapped.

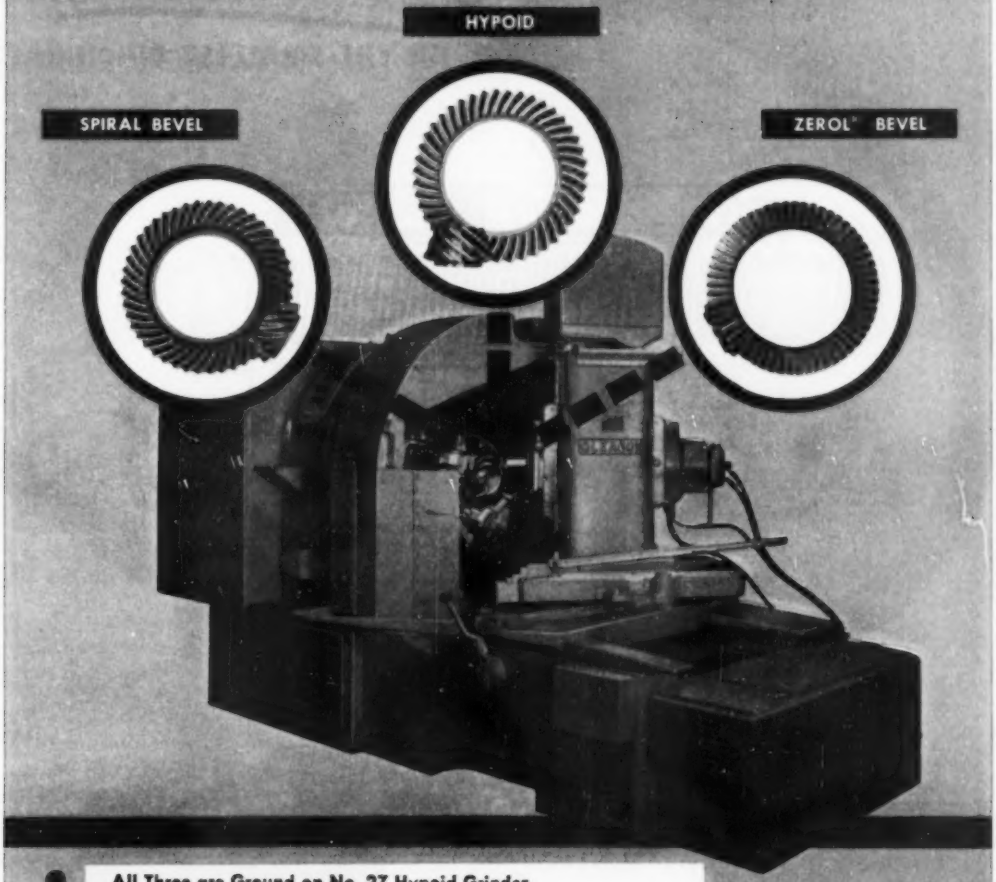


FRANK G. HARDING, chief welding engineer at Solar Aircraft Company's San Diego plant, has been associated with the company for the past eight years. Prior to that he was a resistance-welding specialist for Westinghouse Electric Corporation, Mig Mfg Div. Previously he had been assistant chief engineer for National Casting Co.

He received his BS from the University of Pittsburgh in 1931. He has been active in welding circles for the past 16 years, has written a number of technical papers on resistance welding, and has served on several national committees of the AWS. He cooperates on a story of Solar welding activities in this issue with . . .

HOWARD C. TIEDEMANN, welding engineer in charge of welding development and research at Solar, has been with Solar 3½ years and in aircraft work since 1936. He is a graduate of San Diego State College. He has previously worked for Convair, North American, Lockheed, and Pan-American World Airways, with a wide background of experience in welding and sheet-metal work since 1936. He has designed many specialized pieces of welding equipment for Solar in connection with the jet-parts program.

3 ON 1



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- Automatic Grinding Cycle Eliminates Human Element
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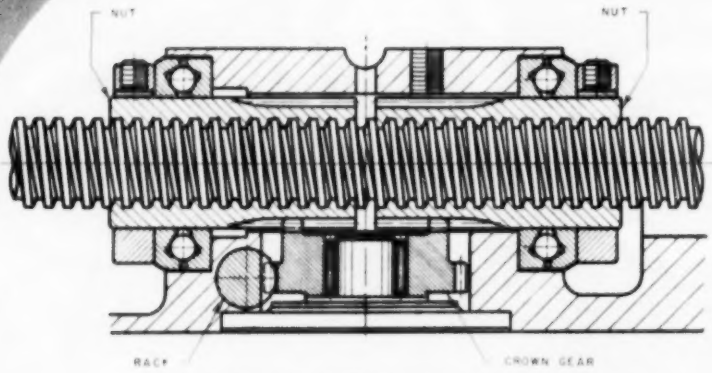
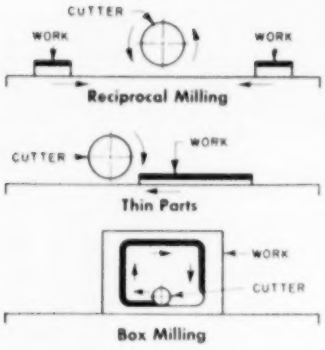
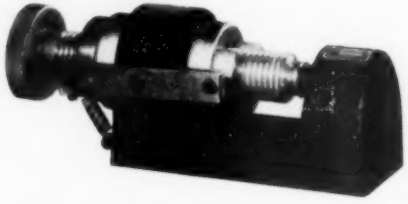


Automatic Backlash Eliminator applied to table feed screw of CINCINNATI knee-type milling machines. Activated during feed stroke; free during rapid traverse and manual table adjustments. Extra equipment for the smaller CINCINNATI knee-types; standard for the larger machines.



Setups like those diagramed here present no special problems when assigned to a CINCINNATI with Automatic Backlash Eliminator.



Demonstration model of Automatic Backlash Eliminator. Ask a Cincinnati representative to show it to you.

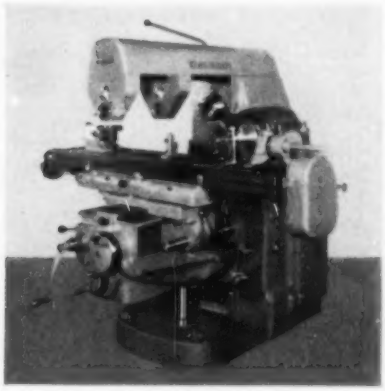
CINCINNATI

exclusive feature

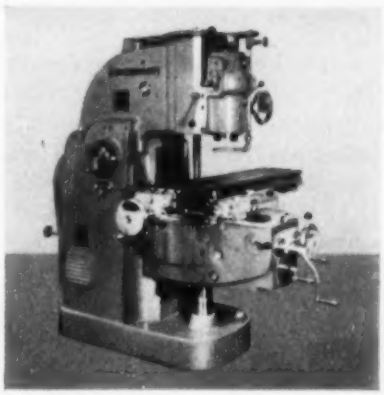
KNEE-TYPE MILLERS

CINCINNATI

CINCINNATI Nos. 2ML and 2MI Plain Milling Machines



CINCINNATI Nos. 2ML and 2MI Universal Milling Machines



CINCINNATI No. 2MI Vertical Milling Machine

In many cases backlash between a feed screw and nut is bad. Especially is this true of a milling cut feeding *with* the cutter rotation, like a rack advancing under a pinion. Cincinnati has a way to eliminate backlash, and they do it *automatically*. A few advantages of this one feature alone are illustrated on the opposite page.

¶ The Automatic Backlash Eliminator, standard feature of the large CINCINNATI knee-types, can also be applied to the small sizes . . . Nos. 2ML and 2MI. Other advantages offered by these small toolroom milling machines include Dynapoise overarm . . . it smooths out the cutting action. Wide range of spindle speeds and feeds changed with a single crank type lever for each. Automatic lubrication for the vertical screw, from individual reservoir.

¶ All in all, CINCINNATI Nos. 2ML and 2MI Milling Machines are tops in the 3 hp and 5 hp classifications. Brief data will be found in Sweet's Catalog File for Mechanical Industries. Or, if you would like to have complete information, write for our 36-page catalog No. M-1662-2.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Superior Quality

Total Indicator Reading .0005" on pitch line runout
Locating Faces Square with hole within .0002"
P.L. Diameter 2" +.0000" —.0005" over wires
Assembled to run with .001" max. eccentricity

BY SUPERIOR

Often in these times, there is need for gears beyond the normal possibilities of so-called mass production.

Happily, though, there are shops where scant tenths-of-a-thousandth are considered generous tolerances—shops where super-precision gear cutting is still traditionally a matter of personal pride with the men who meticulously prepare the blanks and closely supervise the cutting of the teeth.

Fellows is pleased to have just such a customer in Haxton Gears, Inc. of East Rockaway, L. I., New York—and pleased, also, to show the industry these photographic glimpses of their precision work in progress, with the results achieved. If you have quality gears to tool up for, an engineer from the Fellows office nearest you can discuss methods, tooling and costs on a practical basis.

Fellows

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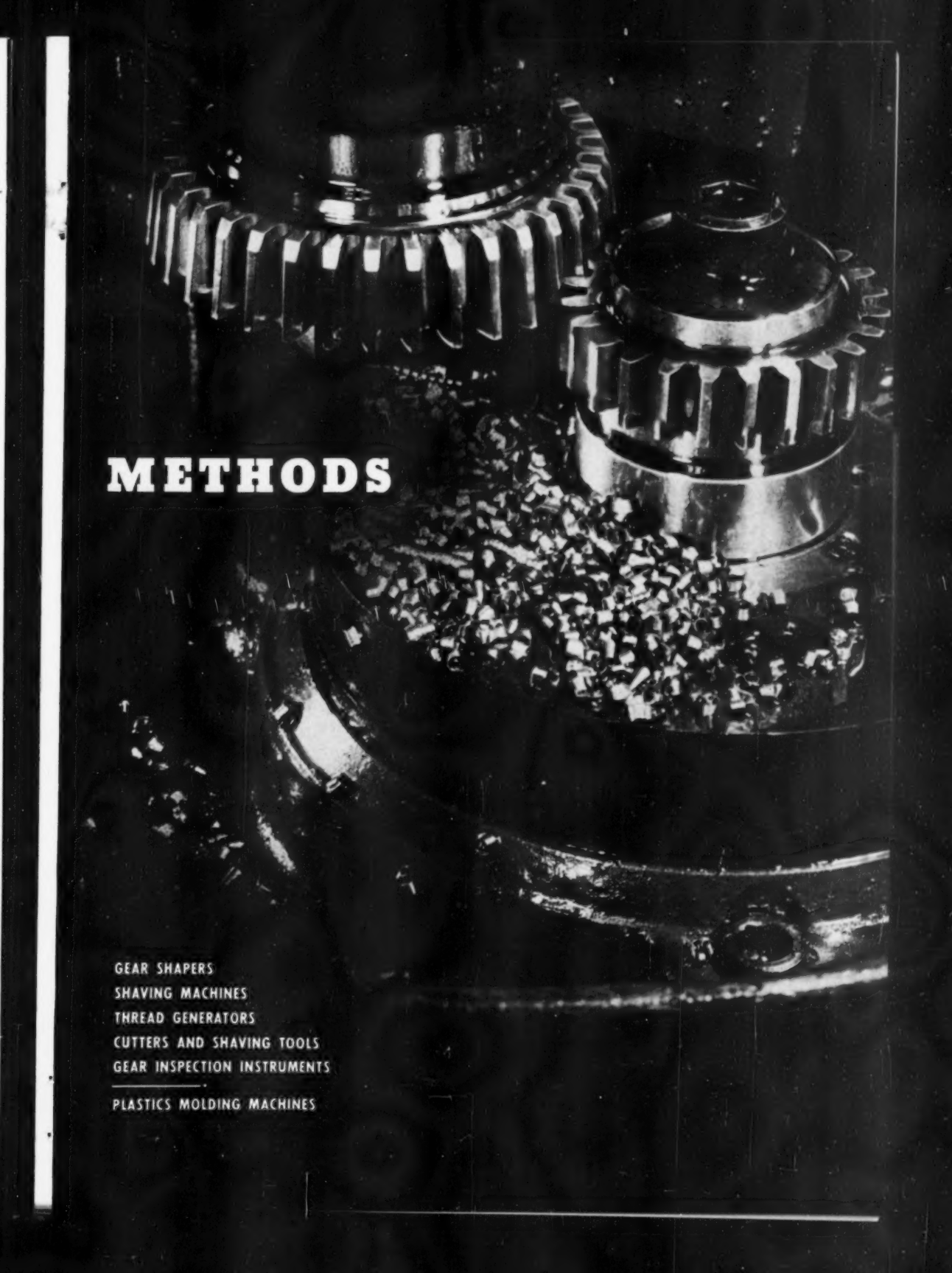


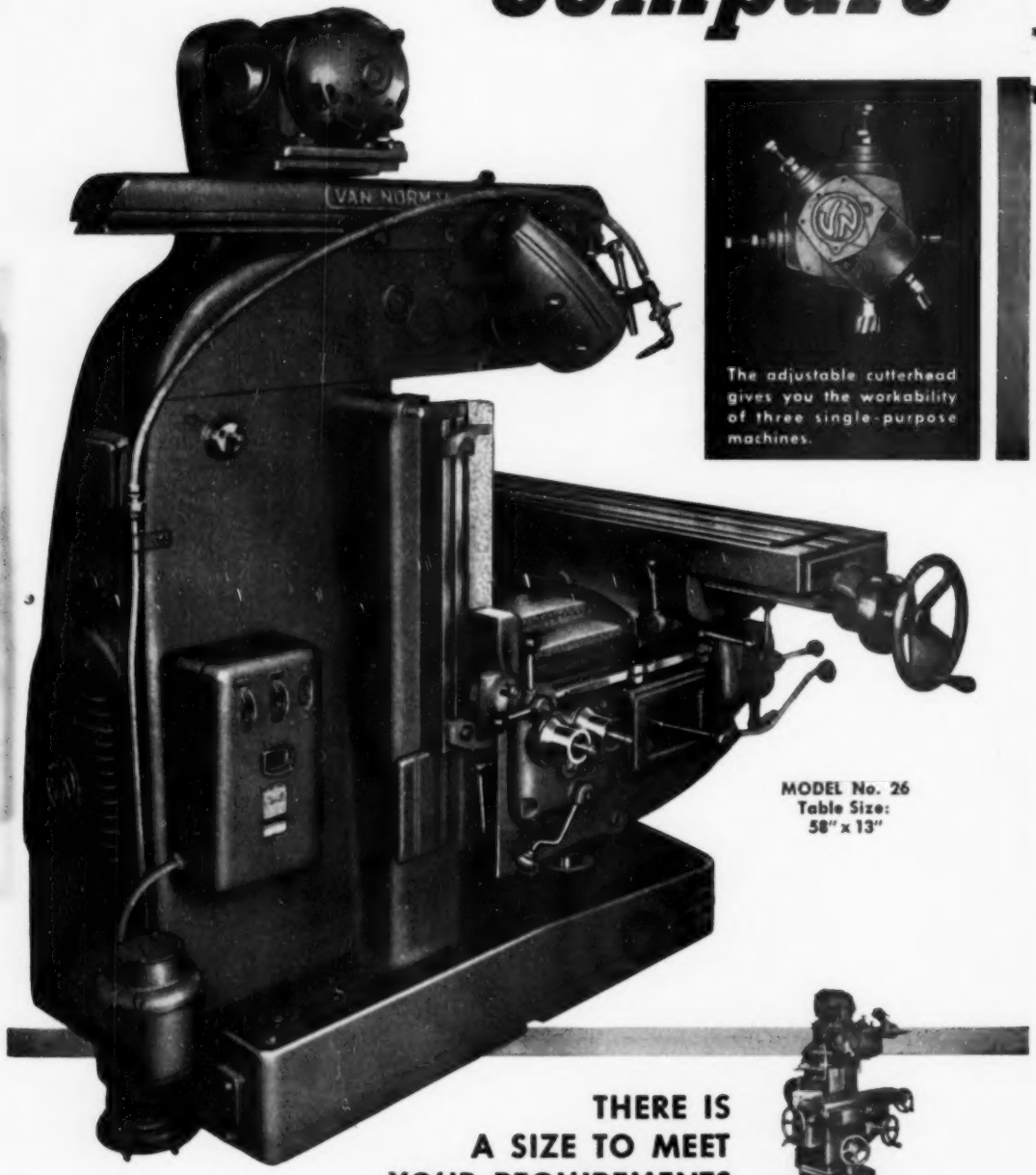
METHODS

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

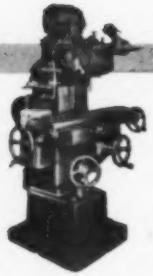
PLASTICS MOLDING MACHINES

Compare

The adjustable cutterhead gives you the workability of three single-purpose machines.



MODEL No. 26
Table Size:
58" x 13"



THERE IS A SIZE TO MEET YOUR REQUIREMENTS

No. 12 — Table: 37½" x 9 3/16"

the Advantages

of VAN NORMAN Ram-Type Milling Machines

They Mean More Production... Lower Costs

Van Norman Ram-Type Millers give you many advantages over single-purpose machines that can help you speed up production and reduce milling costs. With these millers you can do horizontal, vertical, or angular milling, all on one machine. They reduce idle machine and operator time and increase output. Compare the advantages listed against any other miller—

1. **Adjustable Cutterhead permits you to do the work of three single-purpose machines . . . conventional horizontal, vertical or angular milling.**

2. **Movable Ram plus the saddle crossfeed increases the work range and capacity of the miller . . . enables you to handle larger work pieces with ease.**

3. **Front and rear controls on miller sizes 22L and larger permit ease of operation, eliminate back and forth operator walking . . . reduces operator fatigue.**

4. **Quick change speed and feed selectors enable the operator to select the proper cutting speed and feed best suited for each job.**

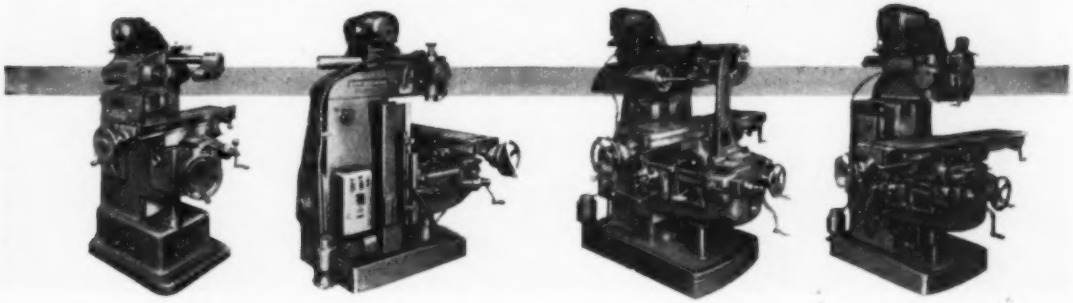
5. **Large, easy to read dials make manual adjustments and work setups easy.**

6. **Rugged base and column, massive cutterhead, large ram and heavy knee, saddle and table assembly provide maximum rigidity and long life accuracy.**

Investigate Van Norman Ram-Type Millers today. Write for bulletin.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS



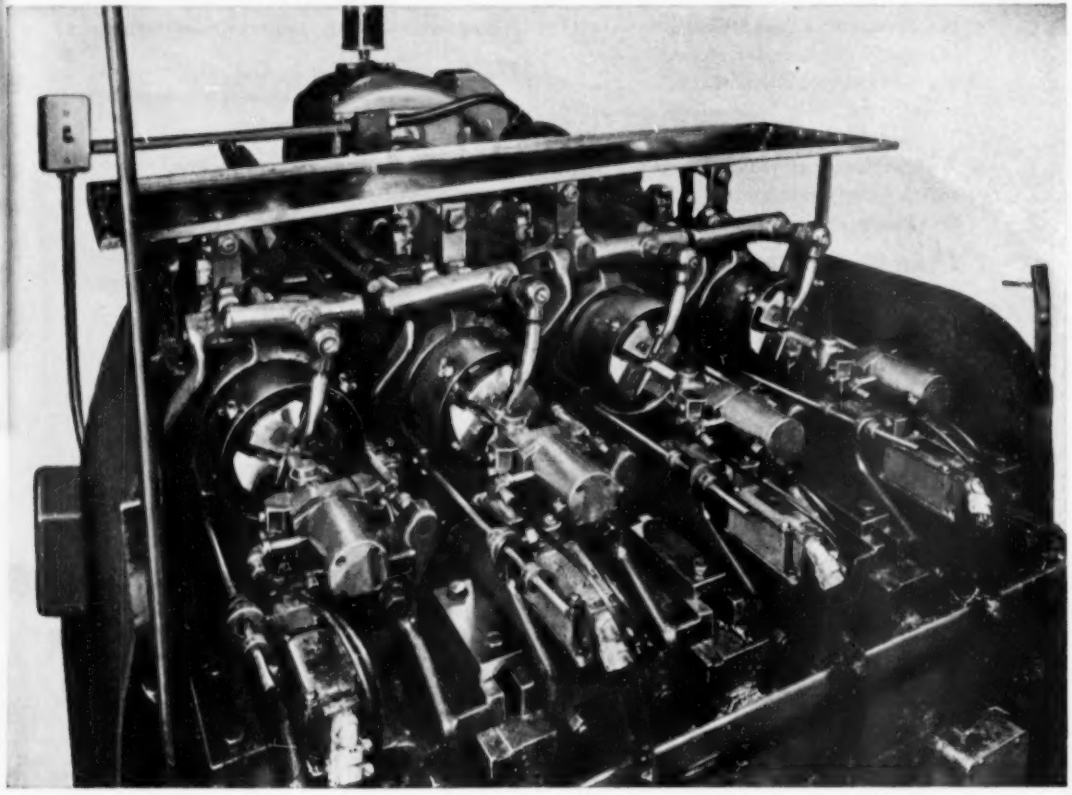
No. 16 — Table: 37" x 9½" **No. 22-L** — Table: 45" x 10" **No. 36** — Table: 64" x 14" **No. 38** — Table: 64" x 14"

LABOR COST
. . . *with* LANDIS *Semi-*

Illustrated in the plant of a large manufacturer of automobile parts is a LANDIS 4 Spindle Semi-Automatic Machine mass-producing 7/16" 18-P threads 2¼" in length on tie rod sockets. The threads are cut to a Class 3 fit at the rate of 520 pieces per hour. This operation was formerly performed on a double-spindle machine . . . at twice the cost in labor.

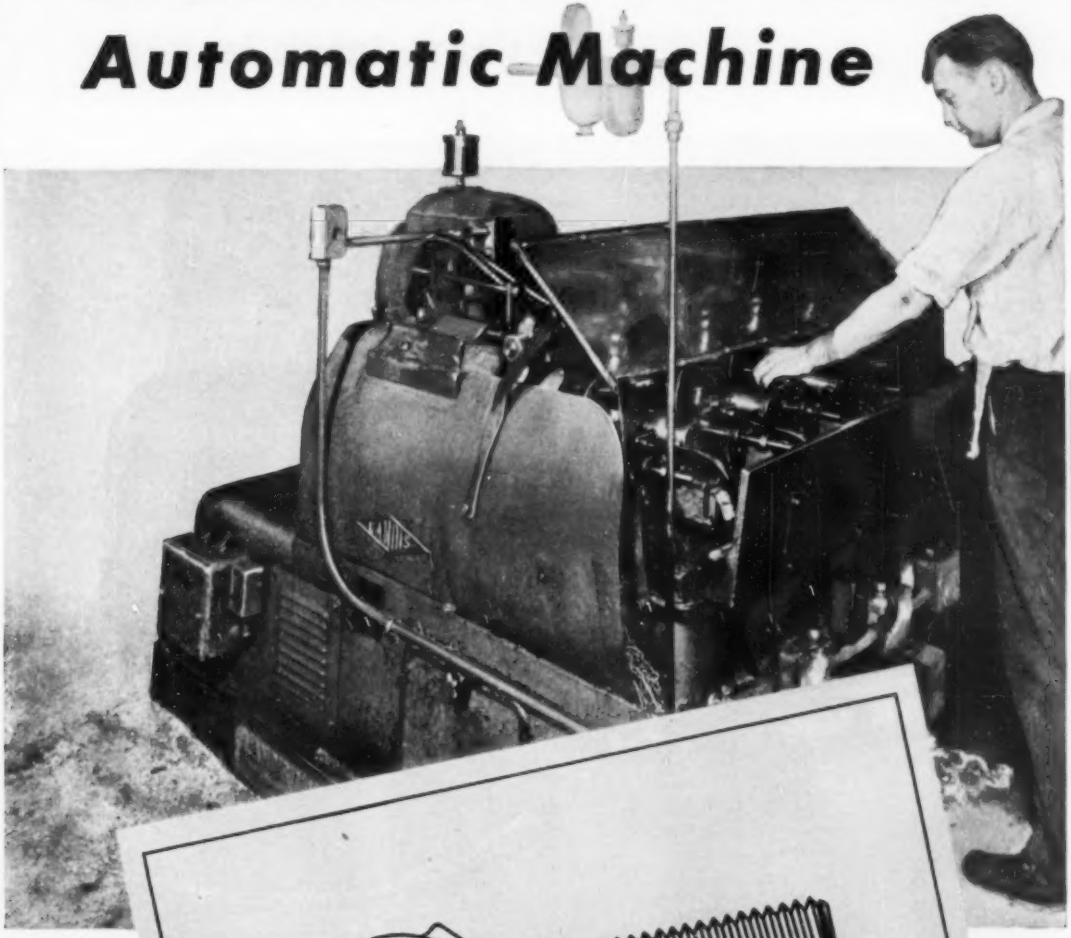
This machine, whose diametrical capacity ranges from ¼" to 1", is designed for the mass-production of precision threads. During the operation illustrated here, manual labor consists merely of placing the blanks on work-holding pins and removing them when threaded. The machine is so compactly built that one operator can easily reach any one of the four work-loading stations from a fixed central position—a feature which enables one man to do the work of two with minimum operating fatigue.

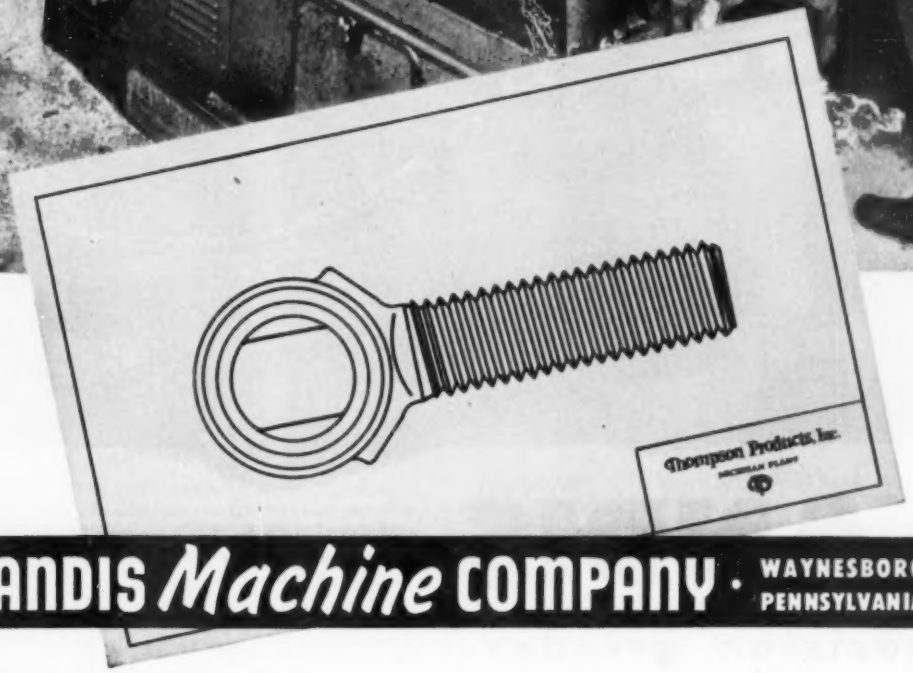
Through the combined output of four die heads, high production is obtained at comparatively low spindle speeds. This feature not only results in finer thread finish, but also greatly extends chaser life, thus effecting a sharp reduction in tool cost. Other advantages inherent in the LANDIS 4 Spindle Semi-Automatic Machine include: quick set-up; thread concentricity; elimination of side-shave; and adaptability to a wide range of threading operations. For complete information, write for Bulletin E-88.



SLASHED 50%

Automatic Machine





LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

More Centerless Output-

Exclusive Landis features

162

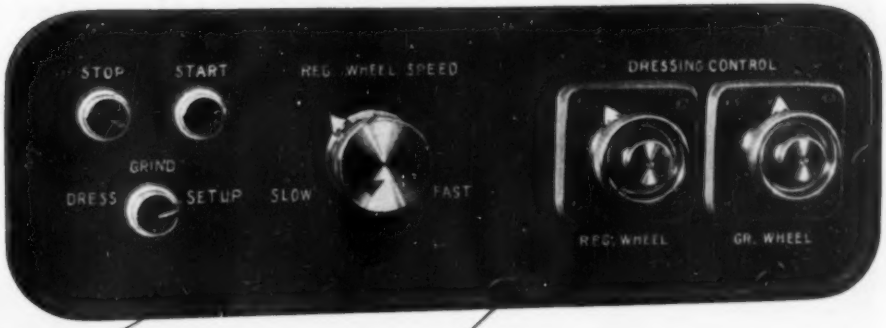
LANDIS

precision grinders

Modern Landis No. 12 Centerless Grinder. For complete information and specifications, write for Catalog T-47.

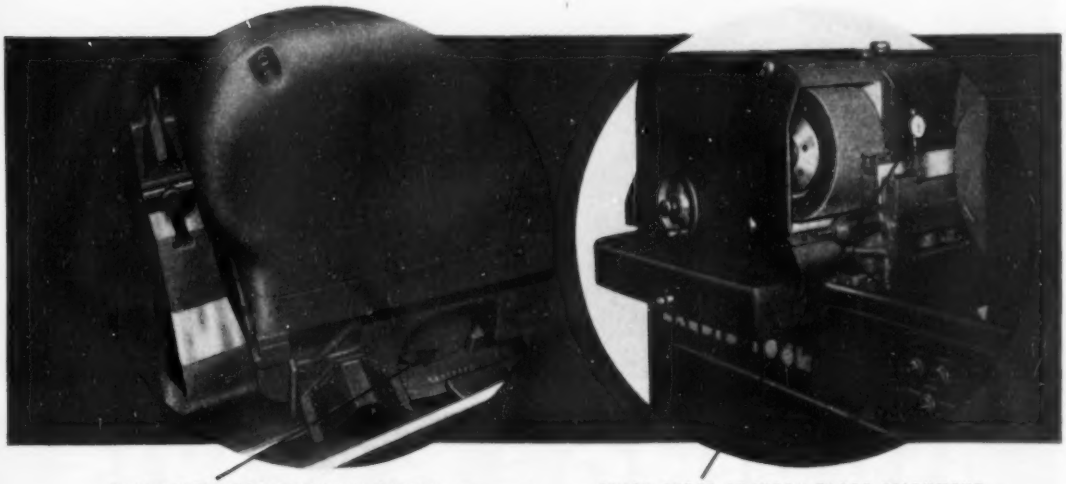
Less Setup Time

cut costs on short production runs



SIMPLE REGULATING WHEEL SPEED ADJUSTMENT
Convenient rheostat control can vary regulating wheel speed from 12 to 100 r.p.m. Any speed, within range, quickly and easily selected.

FAST CHANGE TO DRESSING SPEED—Preset higher speed for dressing regulating wheel obtained by turning selector switch. No readjustment of normal regulating wheel speed is required after dressing.



QUICK SETUP FOR GRINDING TAPERS—Desired taper angle measured with calibrated scale on swivelling regulating wheelbase. Wheel life prolonged as there is no need to dress taper on wheels.

QUICK CHECK OF WORK BLADE ALIGNMENT—Indicator mounted on base shows at a glance if work blade and grinding wheel spindle are in alignment. Hydraulic traverse of base makes checking fast and easy.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Machining

tolerances held to

Here's how one manufacturer put heavy machining on a production basis—at a saving of nearly 75%!

Harnischfeger Corp., Milwaukee, used to machine heavy, bulky weldments on several different machines, each requiring a separate setup. Each increasing lost-time — adding labor costs.

Now—in one setup—through the use of this big, new Giddings

GIDDINGS & LEWIS

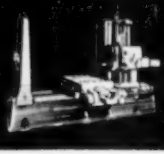
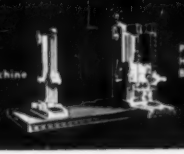
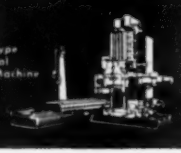


Table Type Horizontal Boring Machine


Floor Type Horizontal Boring Machine


Planer Type Horizontal Boring Machine

Hypro Open-Side Planer

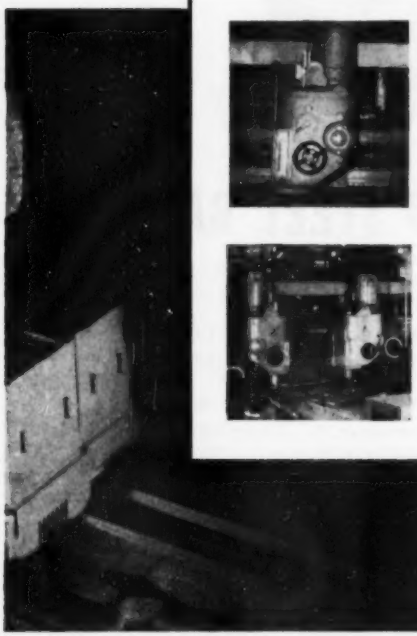
costs cut 75%

.002" on huge weldments

& Lewis planer-miller — capable of performing several operations in a single setup — all of this has changed. Today, Harnischfeger machines, on a strictly production basis, weldments as large as 12' x 9' x 24' — to tolerances within a .002". Overall machining costs reduced approximately 75%.

This is another example of the G&L 5-Point Job Analysis in action. Based on a comprehensive survey of Harnischfeger shop time and work requirements, the new G&L planer-miller checked on every count . . . offered immediate solution to curb ever-increasing costs.

Check the material at the right. See how it may pay you to get a G&L 5-Point Job Analysis.



Each head has its own scales and verniers plus a dial indicator with which gage blocks or measuring rods can be used. Result: *No layout work is required before milling.*

The rail is raised and lowered by a 15-hp motor which also feeds and traverses heads by spline-shaft and bevel-gear drives.

Both rail heads work together to profile-mill the circular roller-bearing path. 12-in. cutters are used on the 10-in. spindles, each driven by a 50-hp motor. Head and table feeds are tied together for the job by manipulation of individual head controls in either push-button station or either pedestal.

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

Write, wire or phone G&L or its nearest representative today. Get the facts on your needs — your problems. Get a G&L unbiased Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

MACHINE TOOL CO.

G&L HYPRO

FOND DU LAC
WISCONSIN

Something
NEW

Van Keuren CALIBRATED STEEL BALLS

Set No. B 23. Calibrated Steel Balls, 23 sets of 3 each 1/16 to 1/2" by 32nds and 9/16 to 1" by 16ths. Complete in Mahogany Case $150.00

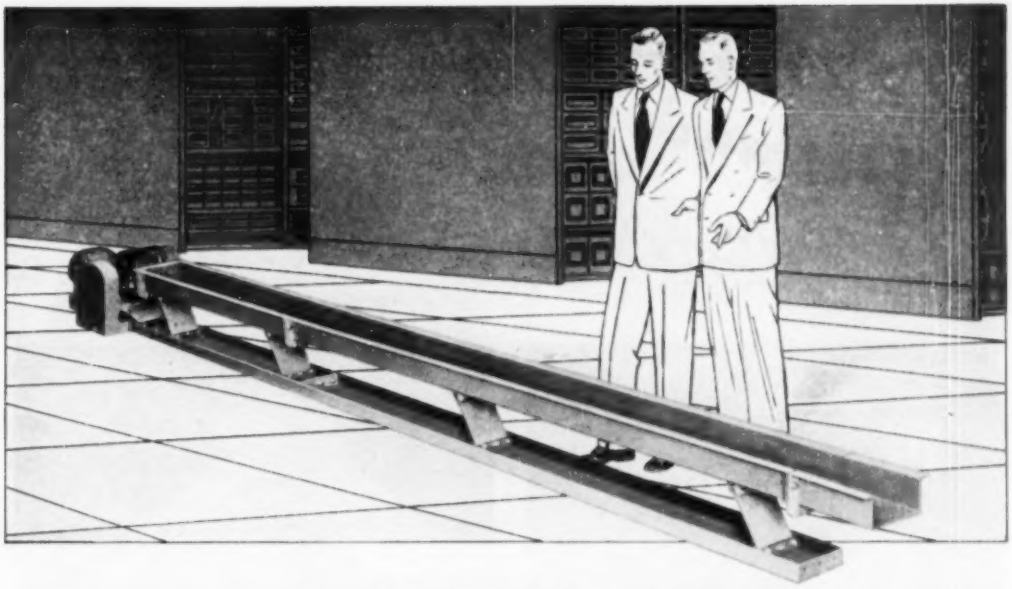
Use VK calibrated steel balls for the precise measurement of internal annular grooves and for comparative measurements on throated worm wheels.

VK calibrated steel balls are selected grade A balls, which are within .0003" of nominal size, but which have calibrations accurate within 25 millionths of an inch.

Complete details on this and other Precision Measuring Tools are given in the Van Keuren 1952 Catalog and Handbook No. 35.

Write for your copy

THE Van Keuren CO.,
173 WALTHAM STREET, WATERTOWN, MASS.
33rd YEAR
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires



Now you can buy FLEXMOUNT Oscillating Conveyors

"right off the shelf"

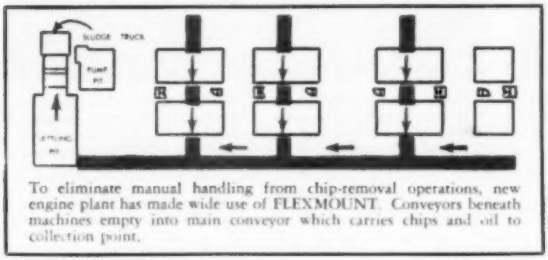
Stock sections make FLEXMOUNT Positive-Action Conveyors easy to order . . . easy to install

Yes, you can now get FLEXMOUNT Oscillating Conveyors for immediate delivery from stock. There's no more waiting for special engineering—stock sections are easily built up to any length desired.

This off-the-shelf service applies to 8, 12 and 18 in. trough widths. For greater capacities, Link-Belt has heavy-duty designs. All offer lower handling costs in carrying off and collecting chips, turnings, punchings, stampings, blasting shot.

Compact, leakproof design makes FLEXMOUNT ideal for moving coolant-soaked chips. Handles bolts, bars, broken tools, even rags without jamming. If desired, dividers can be installed to convey simultaneously two or more types of materials without mixing.

Versatile, low-cost FLEXMOUNT Conveyors are easily kept clean, can be made dust-tight if desired. For all the facts, write for your copy of new Book 2478.



To eliminate manual handling from chip-removal operations, new engine plant has made wide use of FLEXMOUNT. Conveyors beneath machines empty into main conveyor which carries chips and oil to collection point.

How Positive Action moves material...

Positive-action, constant-stroke eccentric drive provides a powerful, yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges. Natural spring action of resilient legs reduces power requirements to a minimum.

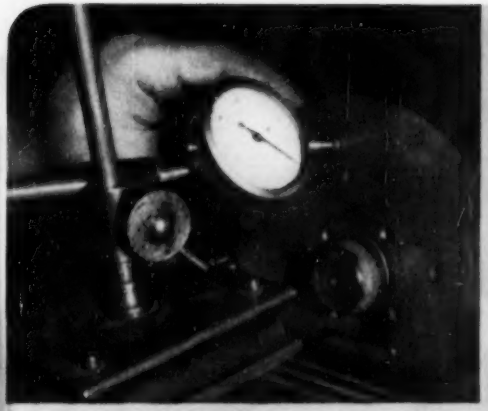
LINK-BELT

12,500-A

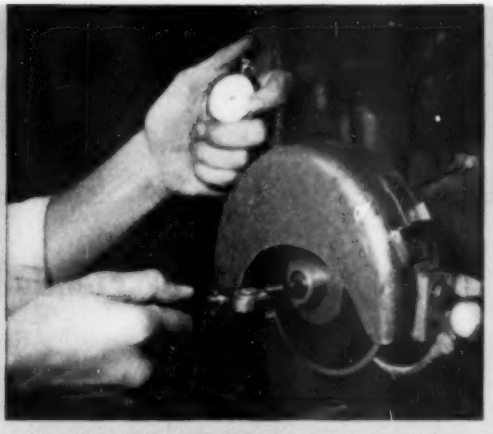
FLEXMOUNT OSCILLATING CONVEYORS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

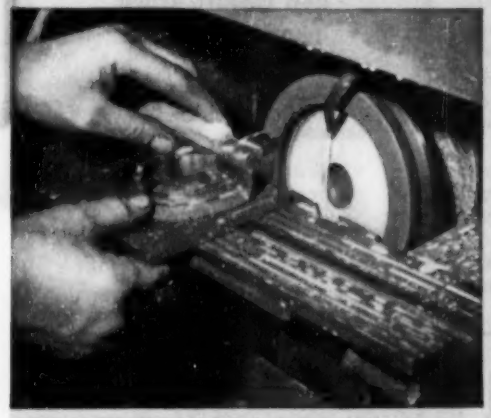
Tips on Diamond Wheel Operation THAT WILL Lengthen Wheel Life and Cut Carbide Grinding Costs



BE SURE SPINDLE AND BACK PLATE RUN TRUE. Before mounting a new wheel, check the spindle and back plate for possible runout. The backs of all Norton diamond cup wheels are precision ground to absolute parallelism with the cutting faces. So, if the spindle and back plate run true, the cutting face of your Norton mounted wheel will also run true.



MAINTAIN CORRECT WHEEL SPEED. For best results, run resinoid and vitrified bonded wheels around 5000 surface feet per minute. At lower speeds they cut slower and wear faster. Metal bonded wheels can be operated at speeds as low as 3000 s.f.p.m.



GRIND WET WHEREVER POSSIBLE. Use a thin mixture of any standard water soluble grinding coolant. If stream is not available, use felt wick saturated with mixture of kerosene and light spindle oil or with a water soluble oil.

TRAIN YOUR OPERATORS. In the interests of better grinding practice, Norton maintains a large library of educational films in sound and color. It will pay you to show your own employees the films on carbide grinding and on the care of diamond wheels. They are loaned without charge.

AND

...See How You Can Save On Many Jobs With The New K-Bond CRYSTOLON* Wheels

Since the limited supply of diamond wheels can't meet the tremendous demand, it is now vital to make your diamond wheels last as long as possible. So remember:

In many applications — especially rough grinding — where you're now using diamond wheels, the new Norton K-Bond Green CRYSTOLON wheels will give you good results.

These faster, freer cutting silicon carbide wheels offer improved uniformity in cutting action. And the new vitrified K-Bond can be so closely controlled that wheels of half-grade increments of hardness are possible — enabling you to "pin-point" specifications to your individual needs.

In addition, Norton CRYSTOLON wheels are also available in a resinoid bond for finishing. Ask your Norton abrasive engineer for a recommendation.

To get maximum results from your expensive diamond wheel investment, be sure to investigate all the possibilities of supplementary grinding of your carbide tools with both bond-types of CRYSTOLON wheels. The chances are you'll find many new ways to save.

YOUR NORTON DISTRIBUTOR CAN GIVE YOU VALUABLE HELP

Besides his own practical experience with abrasive applications, your Norton Distributor can call in Norton Abrasive Engineers for additional expert aid in solving your grinding problems. Take advantage of the great store of Norton knowledge he makes available to you. See him for the *right* wheels to use in your carbide grinding.

GET THESE MONEY-SAVING FACTS

Together, these two fact-filled booklets can do a lot towards helping you make more effective use of your diamond wheels while getting better results throughout the range of carbide grinding. Ask your Norton Distributor for them. Or write direct for Forms 107 and 2241 to NORTON COMPANY, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON ABRASIVES

Making better products to make other products better

KEARNEY & TRECKER MILWAUKEE

CH MILLING SPEED, ACCURACY

Here's a job handled on a new CH-4 Machine

Job: Menasco Mfg. Co., Burbank, Calif. — Straddle Milling Drag Links

Machine: No. 4, Model CH, Plain Style

Part: Shock strut for landing gear cylinder

Cutters: High speed steel inserted tooth

Cutter Speed: 18 rpm, $15\frac{5}{32}$ ipm feed

Chip Load: .005"

Material: 4140 Steel forging, 43 Rockwell

MACHINE COMBINES AND POWER

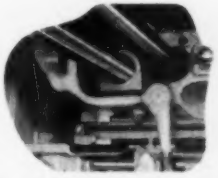
CH MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

Speed range—*24* speed changes are provided from *15* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.

Extra wide feed range — *32* changes from ½" to *90"* per minute meet requirements of new metals and cutting tools for most efficient operation.

Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.

Greater cutting efficiency through design refinements and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed for quiet operation.

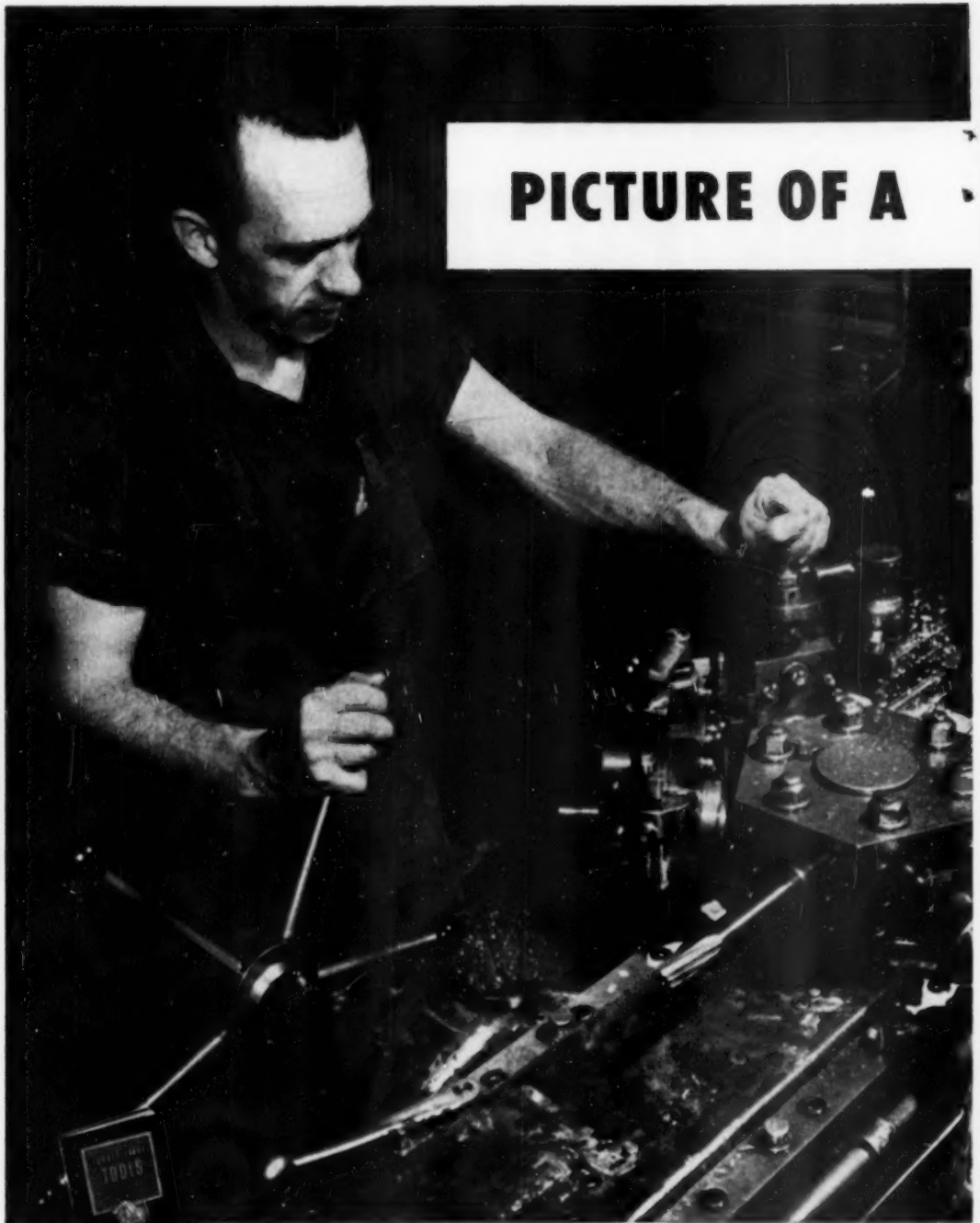


Smoother feed performance through a heavy duty *2"* dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.

Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 15 hp delivered to spindle . . . *3* hp for feed and rapid traverse . . . ¼ hp for coolant.

INVESTIGATE the new CH line of milling machines. These and other features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

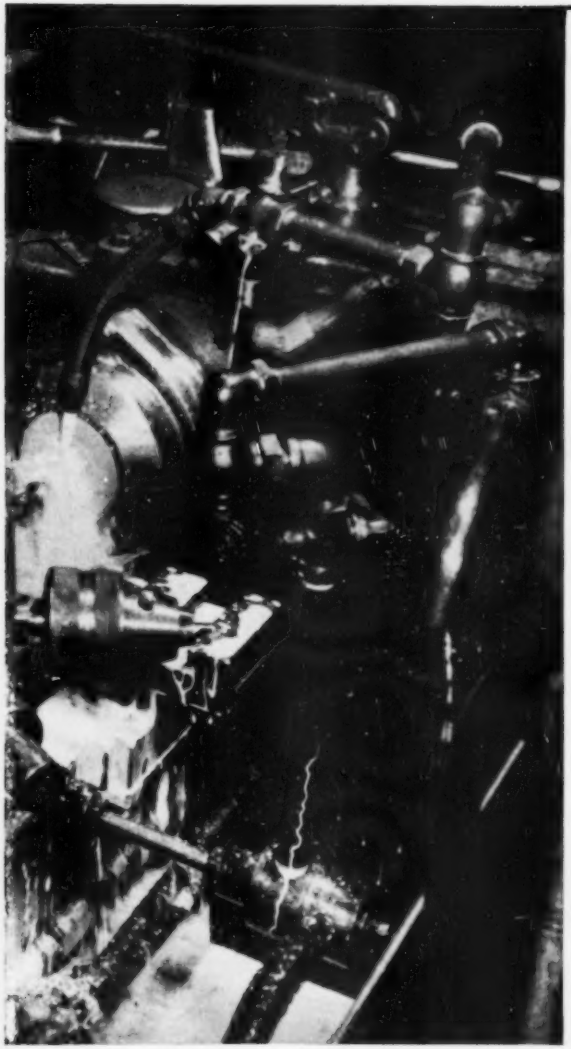
PICTURE OF A



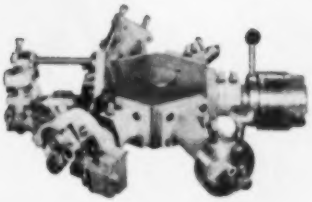
◀ **WRITE FOR YOUR COPY!** Permanent Universal Tooling Setups and the right tools which can help you increase your output are all in the new 204 page Warner & Swasey Tool Catalog.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER

MAN PRODUCING 25% MORE



same job, same operation but *Better Tools!*



Electrol Incorporated, of Kingston, New York, transferred this precision Stop-Plunger job to a Warner & Swasey No. 3 Universal Turret Lathe because it had the speed and accuracy required, as well as the proper tooling for the job. The result was a 25% increase in production of this high pressure hydraulic control part.

This shop has found it can do more jobs faster on Warner & Swasey Turret Lathes with the Standard Tooling Setups that fit their requirements. Multiple and combined cuts, with shorter setup time, mean profitable production increases.

WARNER & SWASEY
Cleveland

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

"Happy to Greet You Again
and to bring you
The Best
of the Season"
from
MORSE
and your
MORSE FRANCHISED
DISTRIBUTOR
MORSE TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASSACHUSETTS

THIS IS

Fosdick automatic positioning

1

2

- Duplicates precision bored, drilled and tapped parts—weeks, months or years apart!
- No jigs needed!
- Automatically positions to ±.0001"!
- Production boosted as much as 250%!
- Doesn't require experienced operators!

THE FOSDICK MACHINE TOOL COMPANY
DEPARTMENT AM — CINCINNATI 23, OHIO

Gentlemen: Please send me catalog 17P containing complete and detailed information on the Fosdick Automatic Positioning Machine.

NAME .....

TITLE .....

COMPANY .....

CITY ..... ZONE ..... STATE .....

CLIP COUPON . . . MAIL TODAY!

DEPT. AM

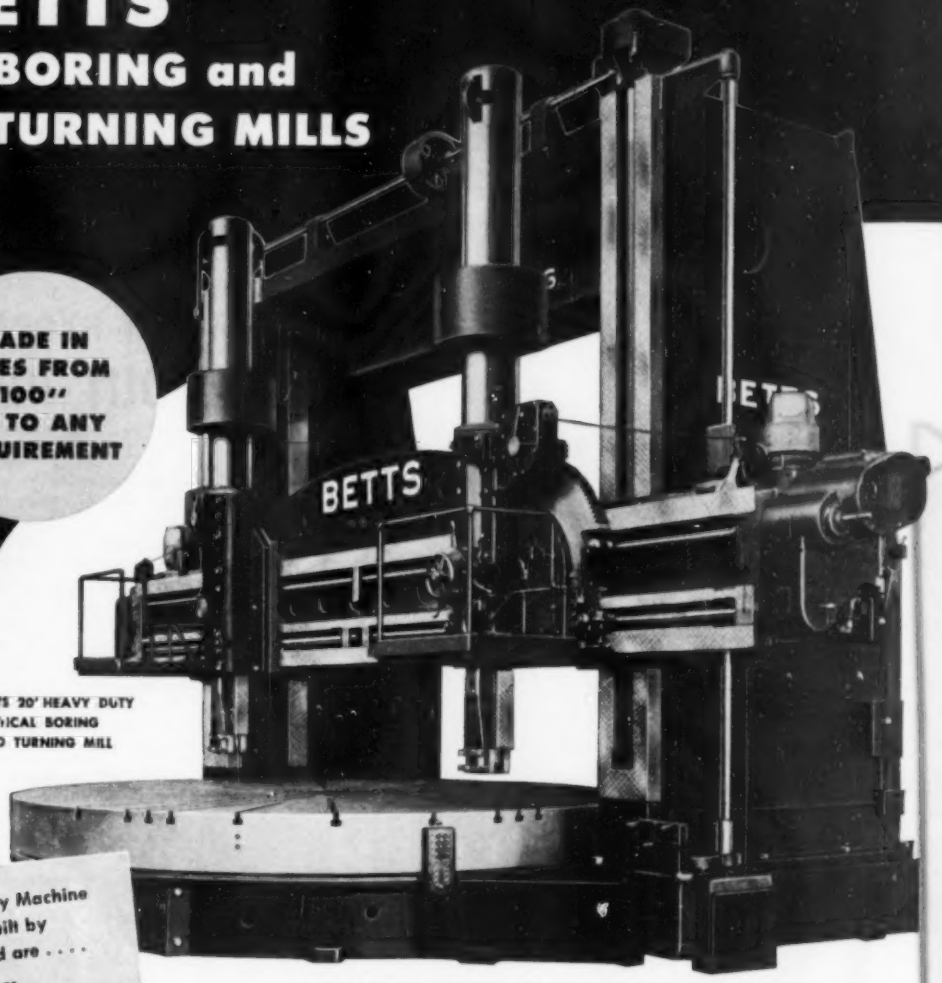
THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

Radial Drills
Sensitive and Upright Drills
Jig Borers
Automatic Positioning Machines
Sensitive Radial Drills

BETTS
BORING and TURNING MILLS

MADE IN SIZES FROM 100" UP TO ANY REQUIREMENT



BETTS 20' HEAVY DUTY VERTICAL BORING AND TURNING MILL

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

Betts Heavy Duty Boring and Turning Mills are general purpose tools of simple, rugged design particulary adapted to heavy continuous operations requiring a high degree of accuracy combined with power. Among the outstanding features that have made Betts Mills leaders in their field, is their type of table mounting that insures positive concentricity. They are built in a size range from 100" swing up to any size to meet your requirements.

Full information covering any size Betts Boring and Turning Mill in which you are interested will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

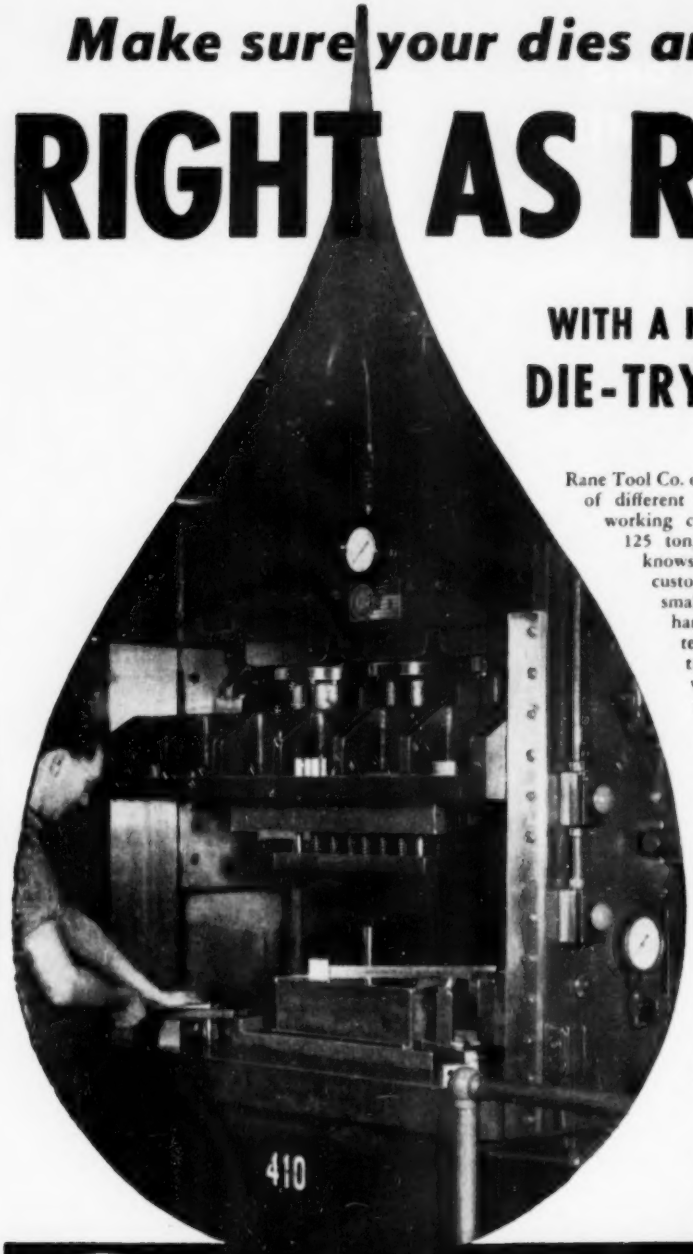
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

Make sure your dies are always

RIGHT AS RANE!

WITH A KRW HYDRAULIC DIE-TRYOUT PRESS!



Rane Tool Co. of Jamestown, N. Y., makes hundreds of different dies for America's leading metal-working companies. Thanks to their KRW 125 ton, 3-cylinder Hydraulic press, Rane knows their dies will work perfectly in the customer's plant. Some Rane dies are small enough to fit in the palm of your hand; others are big babies that take ten men to lift. And all of them are tried out on this KRW press. It's working 95% of every day. And the Rane people tell us it's the most versatile piece of equipment in their shop.

Whether die-making itself is your business, or whether you make dies for your own production use, a KRW die-tryout Hydraulic press will soon pay for itself in time and money saved. With a KRW press in your machine shop you *know* dies will work in production before they leave the shop. There's a KRW Hydraulic press to meet any metalworking problem. 25 - 150 ton capacities, all self-contained above ground; one, two and three cylinder models; hand operated, air operated or motor driven.

•

Ask your machinery dealer to quote you or write, wire or phone Dept. 11 for full facts, prices and delivery dates.

SINCE 1916 KRW A MARK OF DEPENDABILITY

K·R·WILSON

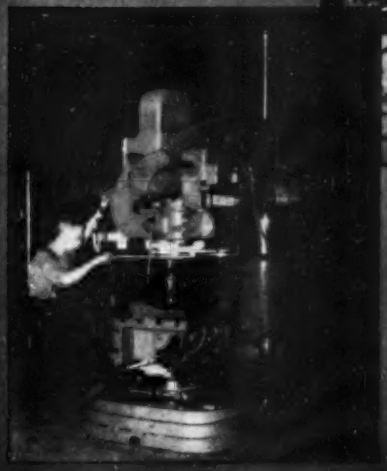
Designers and builders of hydraulic presses to meet any metal working problem

215 MAIN STREET • BUFFALO 2, N. Y.

On — of his job!

This operator is doing a splendid job at Canadair Limited, Montreal, on the production of F-86E Sabre Jets for the RCAF and, as the illustration shows, he is right on top of his job, too.

He is proud of his fine new 5' 17" column "AMERICAN" Hole Wizard Radial. "It's powerful; it's sturdy; it's easy to operate, and I'm not worn out at the end of the day". What more could any operator ask? As a consequence he turns out a lot of fine work which makes his machine a paying investment for the company.



This *"American"* Hole Wizard Radial has a right angle base, on one wing of which is mounted a Bullard Man-Au-Trol Spacer—as shown by the illustration.

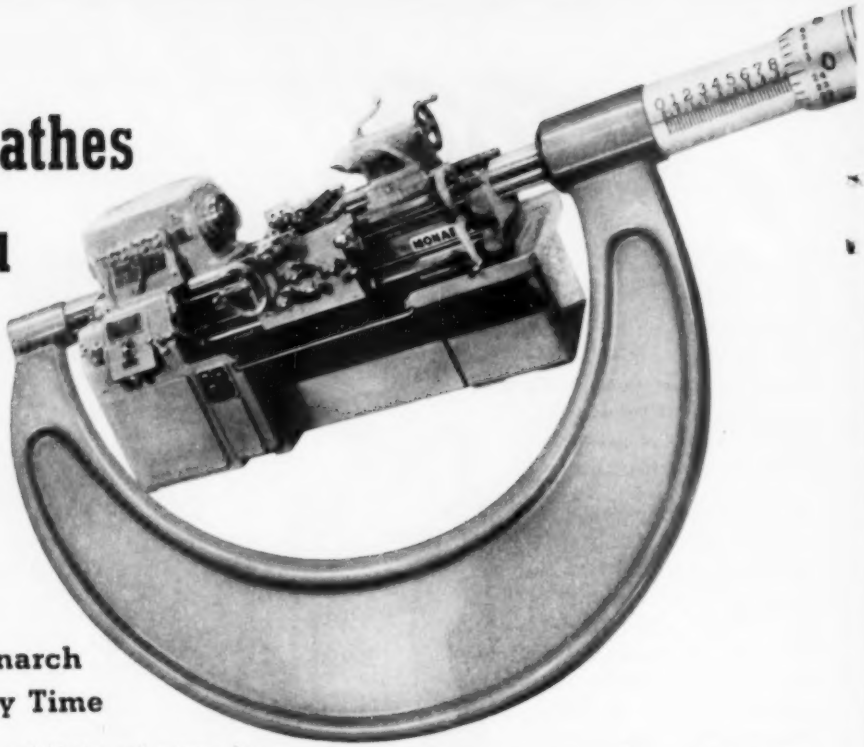
"AMERICAN" Hole Wizard Radials are playing a prominent part in the production of critical defense items for both the U. S. A. and Canada.

For a complete revelation of their virtues send for descriptive data bulletin No. 37.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

GEARED AND RADIAL DRILLS

Check Lathes Like You Check Their Output



...and it's Monarch Series 60 Every Time

You have your mikes and blocks and gauges for checking lathe production. But what kind of test is there for the lathe itself? How can you gauge its performance *before* you buy—at the time when you're establishing the standards for the quality and costs of your entire operation?

This way! Lathe performance is only a reflection of the quality built into a lathe—of its features of design and construction. *So check features*—and check them against the handy yardstick here.

Check, too, the strength, weight and power built into each machine. You not only find every desirable construction feature in the Monarch Series 60—you'll find that *almost every one of them was originated* by Monarch. Doesn't that make the Monarch Series 60—Toolmaker's and Engine Lathes, both—the standard that you're looking for? Write for Bulletin 1113, and see for yourself . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

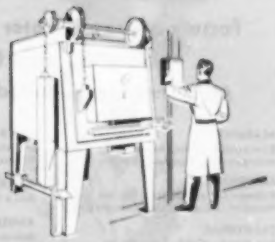
LATHE FEATURE CHECK-LIST	MONARCH	LATHE B
1 Totally enclosed gearbox and end gearing—for sustained accuracy	Yes	?
2 Automatic pressure lubrication—for long life at original efficiency	Yes	?
3 All anti-friction bearings—for peak power and reduced maintenance	Yes	?
4 Hardened, ground or shaved, wide helical gears in headstock—for precision power, easier shifting	Yes	?
5 American Standard Camlock Spindle Nose—for quick, rigid chuck and fixture mounting	Yes	?
6 Flame-Hardened and Precision-Ground Integral Bedways—for sustained accuracy throughout the life of all four ways	Yes	?
7 All critical parts made of hardened alloy steel—for long, trouble-free life	Yes	?

Your proof of protection on all Series 60 Toolmaker's and Engine Lathes, available in 12", 14", 16" and 20" swings—each in various lengths. Most can be equipped with either one of the three Monarch Tracer Controls.

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

for toolroom or high production... quality HEAT-TREATING calls for a WESTINGHOUSE FURNACE...



Typical Westinghouse Box Furnace used in toolroom heat-treating for hardening. Other Westinghouse Furnaces available for carburizing, drawing, ageing, annealing, austempering, brazing, carbonitriding, martempering, nitriding, preheating, sintering, solution treatment.

There's a Westinghouse furnace to provide the exact answer for every heat-treating application . . . gas or electric. For toolroom or for low-to-medium production applications, choose from over fifteen standard types of box furnaces, ten protective atmospheres. J-10373

SEND FOR FREE BOOK...

YOU CAN BE SURE... IF IT'S Westinghouse

HEAT-TREATING FURNACES

Westinghouse Electric Corporation,
Industrial Heating Department
Meadville, Pennsylvania

Please send me free booklet, "Westinghouse Furnaces for the Toolroom, Laboratory or Production Line"

Name _____

Firm _____

Title _____

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Factory approved motor service in every industrial area from 97 Allis-Chalmers Certified Service Shops.

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Birmingham—Elec. Repair & Serv. Co.
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Marion—Giles Armature & Elec. Wks.
Mt. Vernon—Dawson Electric

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Indianapolis—Scherer Electric Co.
Evansville—Evansville Elec. & Mfg. Co.

IOWA
Sioux City—Smith Elec. & Supply Co.

KANSAS
Salina—Cent. Kans. Elec. Mach. Co.
Wichita—Tarrant Electric Mach. Co.

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Springfield—Elec. Motor Repair Co.

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Saginaw—Banning Elect. Prod. Corp.

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MISSISSIPPI
Vicksburg—Ludke Electric Co., Inc.

MISSOURI
Kansas City—Boese-Hilburn Elec. Co.
St. Louis—French-Garloman Elec. Co.
Springfield—Springfield Elec. Serv.

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Omaha—Omaha Electrical Works

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Concord—A. S. Tracy

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Paterson—Elec. Service Repair Co.
Trenton—Lockwood Elec. Motor Serv.

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Albuquerque—Electric Motor Company
Powell Electric Co.

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Buffalo—Robertson Electric Co.
Jamestown—A. E. Westburgh
Mt. Vernon—H. A. Schrack, Inc.
New York—Consol. Elec. Motor Co.
Rochester—Vanderlinde Elec. Corp.
Utica—Mather, Evans & Diehl Co.
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NORTH CAROLINA
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Greensboro—Southern Elec. Serv. Co.
Rocky Mount—Hammond Elec. Co.

OHIO
Cincinnati—Cincinnati Elec. Equip. Electric Service Co.
Akron—A-C Supply Co.
Toledo—Romanoff Elec. Motor Serv.
Youngstown—Winkle Electric Co.

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Oklahoma City—Southwest Elec. Co.
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SOUTH CAROLINA
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Sioux Falls—Electric Motor Repair

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Of course, Allis-Chalmers Certified Service Shops give good service on any electrical equipment, of any make. Tear out this ad and save it, or write the name of the A-C Certified Service Shop nearest you in your address book. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3864

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CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

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ALLIS-CHALMERS

TO THE WORLD IN GENERAL

and to you in particular . . .

Merry Christmas

AND A HAPPY NEW YEAR

At this season it behooves all of us to look back over the past year to the many accomplishments which have come about in our organizations and review the situation as to betterment of productive capacities for the coming year. A job well done can usually be improved upon and with the new year, it is well to consider equipment and modern manufacturing methods with their attendant savings in cost.

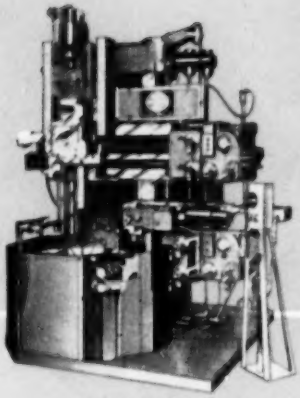
Consider then the advantages which Bullard equipment listed on the following page may afford you in your plant operation during the year 1953 and many years to follow.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

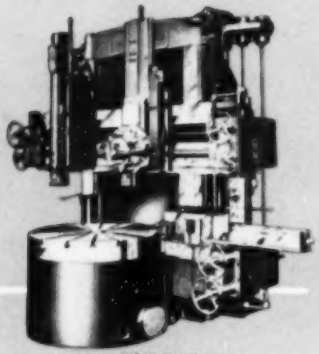
MANUFACTURERS OF MULT-AU-MATICS, CUT MASTER AND MAN-AU-TROL VERTICAL TURRET LATHES, SPACING TABLES, AND HORIZONTAL BORING, MILLING AND DRILLING MACHINES.

BULLARD MACHINE TOOLS

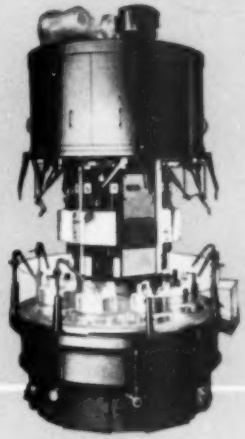
FOR GREATER MANUFACTURING ECONOMY



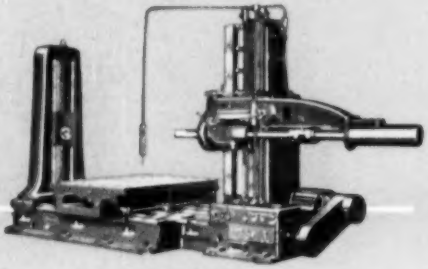
Man-Au-Trol Vertical Turret Lathe
30" — 36" — 42" — 54" — 64" and 74" sizes



30" and 36" Cut Master
Vertical Turret Lathe with two heads
42" — 54" — 64" and 74" available
with several combinations of heads



Mult-Au-Matic Type "D"
with a wide range of sizes
and numbers of spindles



4" and 5" Spindle
Bullard Horizontal Boring, Milling and
Drilling Machines with 4-Way bed

30 x 20 Spacing Table mounted on Super
Service Drilling Machines. It may also be
mounted on 4' — 5' or 6' Radial Drills

Bullard's variety of machine types covers a wide range of requirements For the diversified industries

Industry Selects BULLARD Equipment for Its MANUFACTURING EFFICIENCY

BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

Another Way CIMCOOL Makes Jobs Better

Look at Cimcool® from an operator's viewpoint. Then you'll readily understand why machinists are so enthusiastic about this radically new and different cutting fluid. It leaves no slippery film on shoes, floor, machine or work. It doesn't soil clothing or hands. It contains no skin irritants.

And look at some other reasons why machinists stand up and cheer when Cimcool's on the job: Can't smoke. Can't burn. Virtually eliminates rancidity and foul odors. Cools so fast that tools and chips actually stay cool to the touch. *And this revolutionary chemical emulsion does a better job.*

Any way you look at it, Cimcool is the biggest working improvement in years. For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "CIMCOOL Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

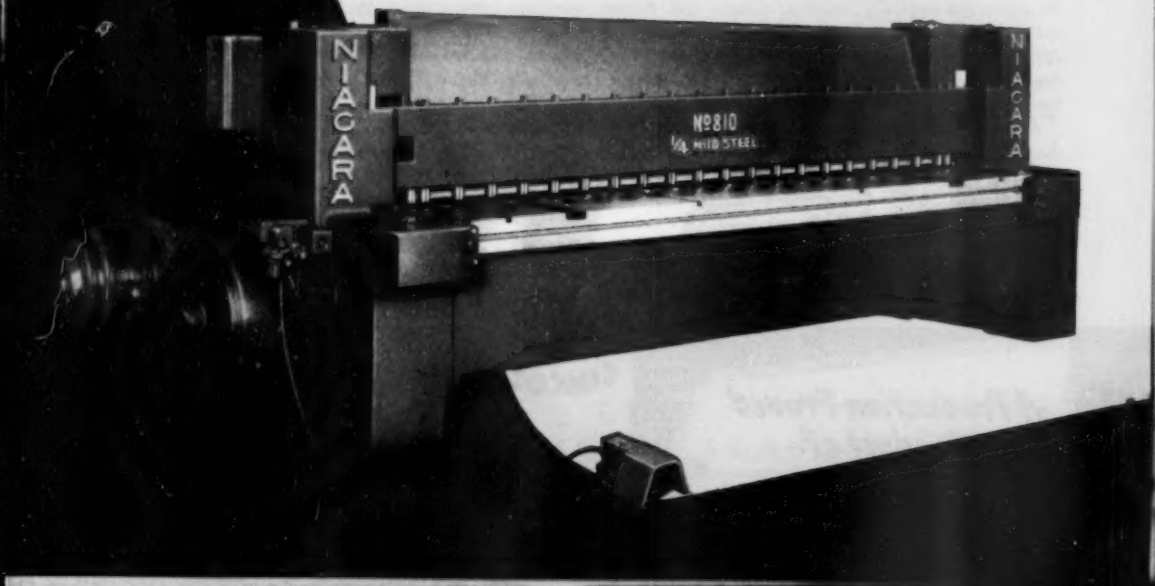
®Trade Mark Reg. U.S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

NIAGARA SHEARS

at General Sheet Steel Co., Detroit, Mich.



NIAGARA

POWER SQUARING SHEARS

after shearing
thousands of tons
of steel
of all kinds

LET'S LOOK AT THE RECORD!

NIAGARA
Shears are designed for
- **HIGH VOLUME SHEARING**
- **ACCURACY**
- **DEPENDABILITY**
- **LOW MAINTENANCE COSTS**

Write for Bulletin 69

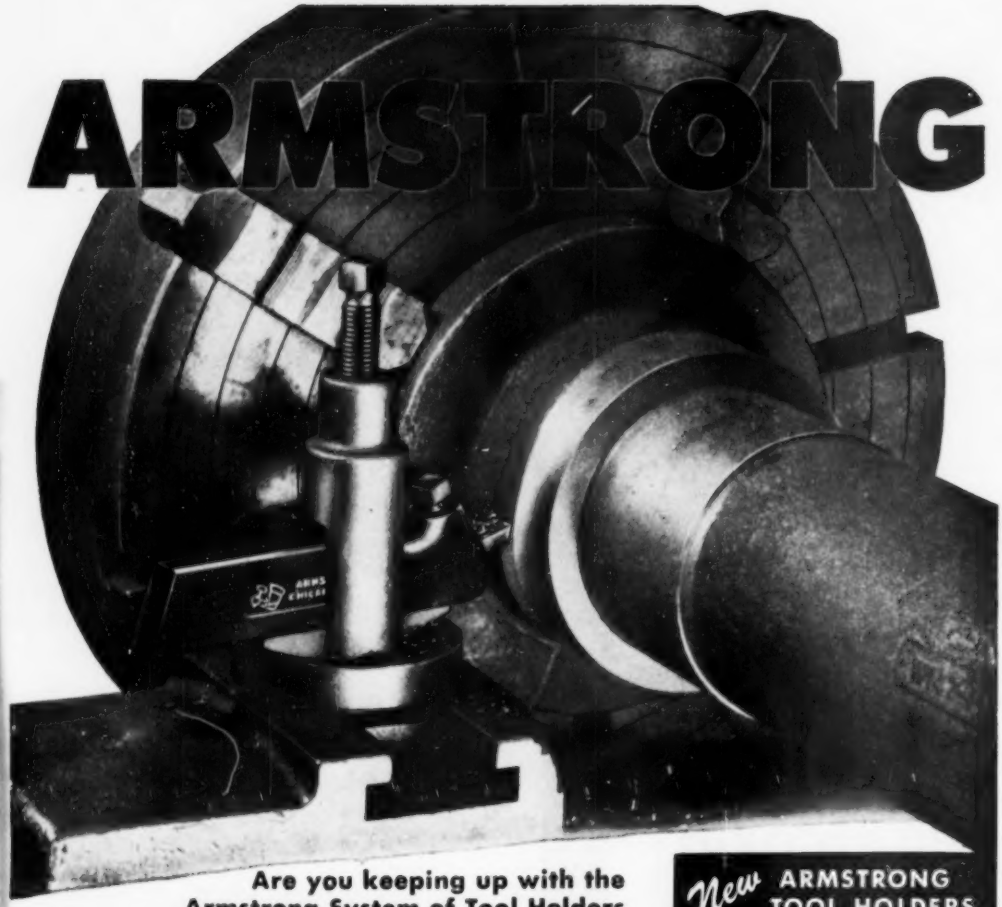
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

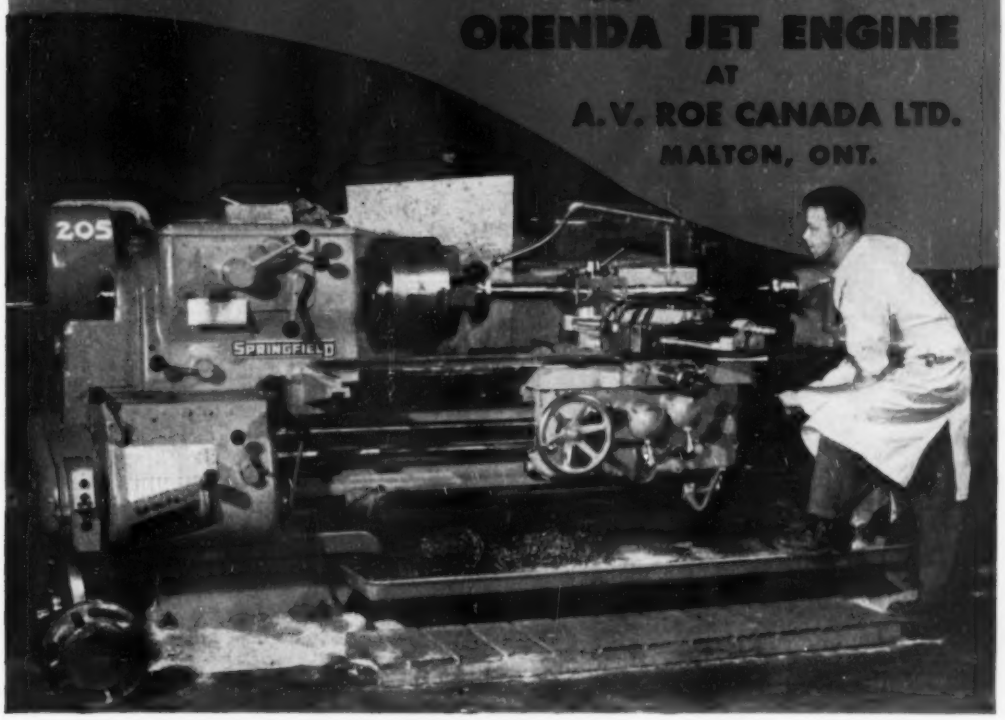
New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG C-A Tool Holders for ARMALOY Cast-Alloy Cutter-Bits

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL

SPRINGFIELD LATHES

TURNING PROBLEMS SOLVED ON ORENDA JET ENGINE AT A.V. ROE CANADA LTD. MALTON, ONT.



SPRINGFIELD CONTOURING LATHE BORING INTERNAL PROFILE ON STUB SHAFTS FOR ORENDA JET ENGINE

The precision and high productive capacity of Springfield Lathes makes them ideally suited for the rigid demands of Jet Engine production.

Years of experience adapting engine lathes to the production of all types of work has enabled us to build into Springfield Lathes the quality which assures top performance in operation.

Benefit by our long experience through the advanced design, sturdy reliability and production capacity of Springfield Lathes.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

Production rate up 1100% when switch is made to

CARD TAPS

The job was tapping soft steel parts made from SAE 1010 steel. The holes were extruded and tapped $\frac{3}{8}$-18 NPT. But with the taps being used a midwest metal fabricator was getting only 200 to 300 tapped holes, which was considered pretty good at the time.

Then somebody said he really ought to be getting more, so the shop superintendent decided to investigate. He called in a Card representative and talked over the matter with him. Solution: A Card High Speed Interrupted Pipe Tap was put on the job. Result: 4,267 tapped holes — or an increase in production of more than 1100%.

Meet him. Your Card representative, backed by Card's engineering staff is always available for aid on any problem. S. W. CARD MANUFACTURING COMPANY, Mansfield, Massachusetts. Division of Union Twist Drill Company.

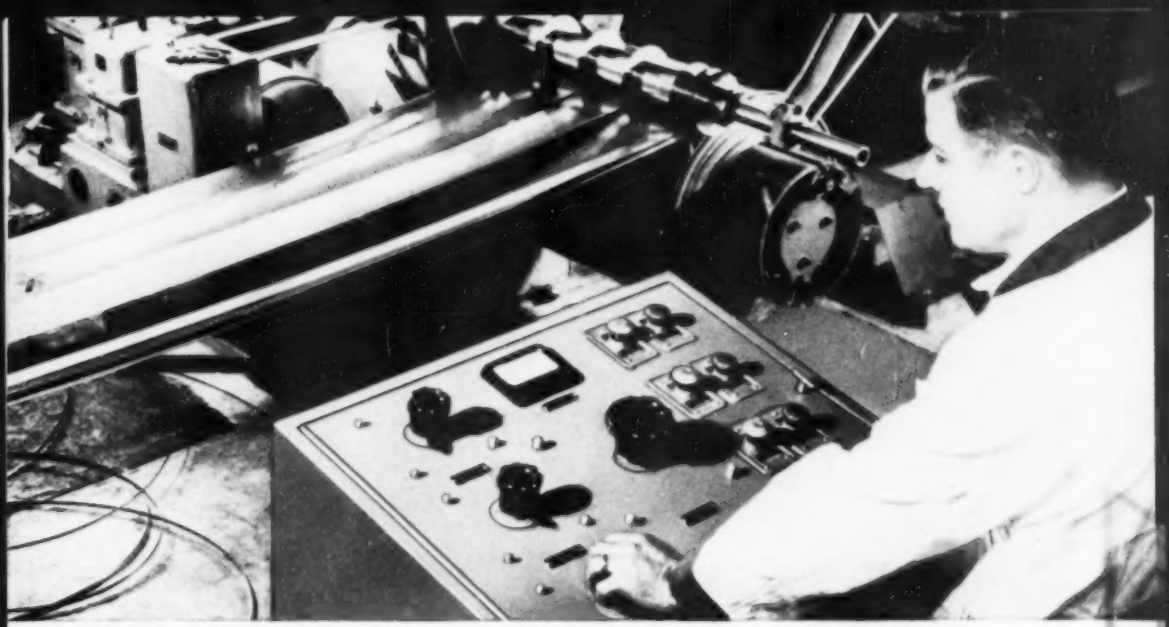
SEE YOUR CARD DISTRIBUTOR FOR PROMPT DELIVERIES AND HELPFUL SERVICE

The CARD Quality

TAPS

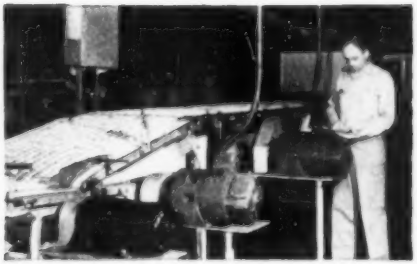
Production Proved For Lasting Accuracy

Also makers of DIES • SCREW PLATES • DIE STOCKS TAP WRENCHES



G-E SPEED VARIATORS, operated by central control panel (above) were chosen by E. F. Huuserman Co. of Cleveland, Ohio for its steel slitting operation. General Electric Speed Variators provide flexible performance in the 1–200-hp range at moderate cost. For even greater accuracy and versatility in automatic operation, these drives may include amplidyne or electronic regulators.

These G-E Adjustable-speed Drives can help you boost your output, too!



G-E THY-MO-TROL* drives assure the Keebler Weyl Baking Co. of Philadelphia of proper baking for many different products. This electronic control is particularly suited for precise adjustable speed in 1/4 to 10-hp drives—offers speed ranges to 100:1 and more.

◀**G-E ACA MOTORS** give the Ford Motor Company a simple, compact, and lowest-cost method of controlling pump speeds at its oxygen generating plant, leased from Air Products Inc. This adjustable-speed motor requires no conversion equipment—an a-c induction motor with stepless speed adjustment by a simple twist of a dial.

*Reg. trade mark of General Electric Co.

WHICH G-E DRIVES ARE BEST FOR YOU?

Because only General Electric makes *all major types* of electric adjustable-speed drives, it is best qualified to help you select the *right drive*. Send for these informative bulletins.

- ☐ **A** This 26-page manual describes *all* four types of drives and where to apply them. Bulletin GEA-5334.
- ☐ **B** Lower cost, simplest a-c drive Bulletin GEA-4883
- ☐ **C** More flexibility, moderate cost. Bulletin GEA-5335.
- ☐ **D** Top performance, ¼-10 hp Bulletin GEA-5337.
- ☐ **E** Top performance, 1-200 hp Bulletin GEA-5336.

General Electric Company,
Section P646-19
Schenectady 5, N. Y.

Please send me the bulletins checked

- ☐ for reference only
- ☐ for planning an immediate project

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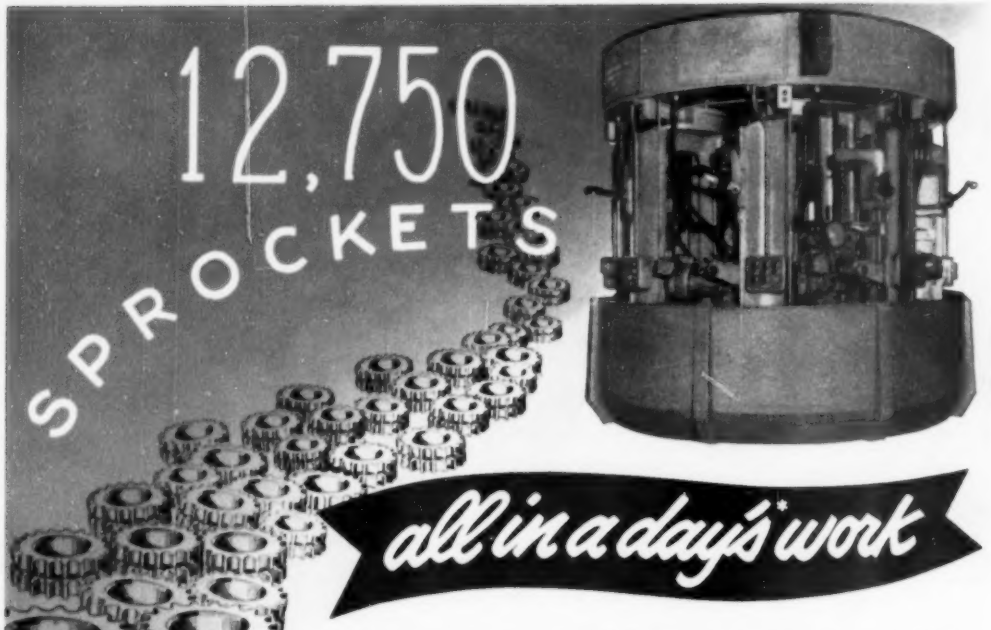
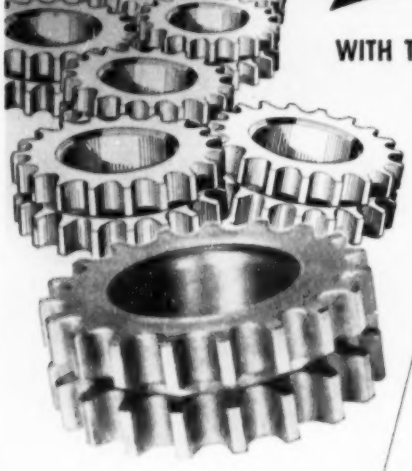
GENERAL ELECTRIC



all in a day's* work

WITH THE LEES-BRADNER MODEL 7-A 8-SPINDLE HOBBER



*Running at 100% efficiency on 3 8-hour shifts.

● Sprockets, sprockets, sprockets! Imagine 12,750 precision-made sprockets a day . . . that's the amazing capacity of the Lees-Bradner Model 7-A 8-Spindle Automatic Hobber.

These are center guide sprockets. They are 3" in diameter, have 19 teeth each, and are made from SAE 1040 steel. Close tolerances are mandatory because the sprocket is used in the timing mechanism of an automobile engine.

PRODUCTION FACTS

½" pitch chain sprocket
19 teeth
SAE 1040 steel
Hob diameter: 4"
No. of starts in hob: 2
Hob speed: 230 RPM
Feed: .060

The simplicity, ruggedness and ease of operation of the 7-A have made it first choice in high production plants. Automatic push-button controls make it possible for even unskilled workers to set production records.

Your Lees-Bradner representative will be happy to give you all the facts on the Model 7-A 8-Spindle, 6-Spindle, 4-Spindle or Single Spindle Hobbers. Call him or write us for his name and address.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U. S. A.

B·S

Productioneered

...for new high precision gaging

NEW No. 955 ELECTRONIC CALIPER

Now you can measure work-in-process as close as .00001"— without removing the work from the machine, fixture, or bench. Just apply the portable No. 955 Brown & Sharpe Electronic Caliper to the work and take your readings on the Electronic Amplifier. This precision caliper with adjustable back rest for positioning the work is designed for fast, positive measurements . . . it's "Productioneered" for precise quality control under mass production conditions.

EXCLUSIVE ADVANTAGES

- Measures on the machine, fixture or bench
- Amplifier adjustable for readings in units from .0001" to .00001"
- Carbide measuring faces
- Only one master required for each setting
- Unaffected by dust or moisture
- Adjustable measuring pressure
- Aligning attachment for long work
- Easy to grip and apply to work

SEE NEXT PAGE FOR OTHER ILLUSTRATIONS AND SIZES

Brown & Sharpe

B&S

Productioneered

...for precise quality control on work from 0" to 4"

NEW No 955 Electronic Caliper

Used in conjunction with the No. 950 Electronic Amplifier, the new No. 955 Brown & Sharpe Electronic Caliper allows you to measure precisely in units varying from .0001" to .00001" without disturbing the work set-up. A measuring range from 0" to 4" is provided by four interchangeable jaws that attach securely to the caliper body. Each jaw has a range of 1" and requires only one master for any particular measurement.

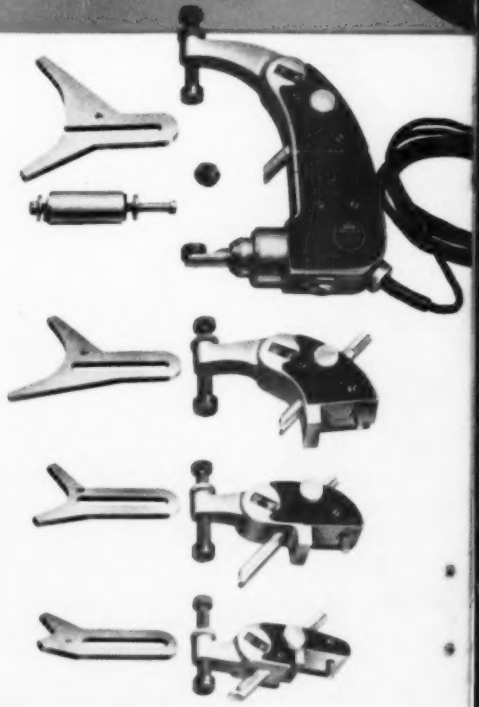
An aligning attachment, shown in illustrations above, is available for measuring long work pieces. Together with a spherical measuring point on the caliper jaw, this attachment provides a three-point bearing when the caliper is applied to the work . . . assures positive alignment and accurate readings.

ELECTRONIC CALIPER SETS

With the complete No. 956 set shown you can measure any size work from 0" to 4". It includes the caliper body, all four interchangeable jaws, and aligning attachment in a wooden case. The Electronic Caliper is also available in set No. 957, having the same range as set No. 956, but without the aligning attachment.

Write for new illustrated catalog describing the full line of Brown & Sharpe Electronic Production Measuring and Inspecting Equipment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

WE URGE BUYING THROUGH THE DISTRIBUTOR



Brown & Sharpe

B&S

Milling Machines • Grinding Machines • Screw Machines • Cutters
Machine Tool Accessories • Machinists' Tools • Johansson Gage Blocks
Electronic Measuring Equipment • Permanent Magnet Chucks • Pumps

PRINTED IN U.S.A.

THE NEW BRITAIN MACHINE COMPANY

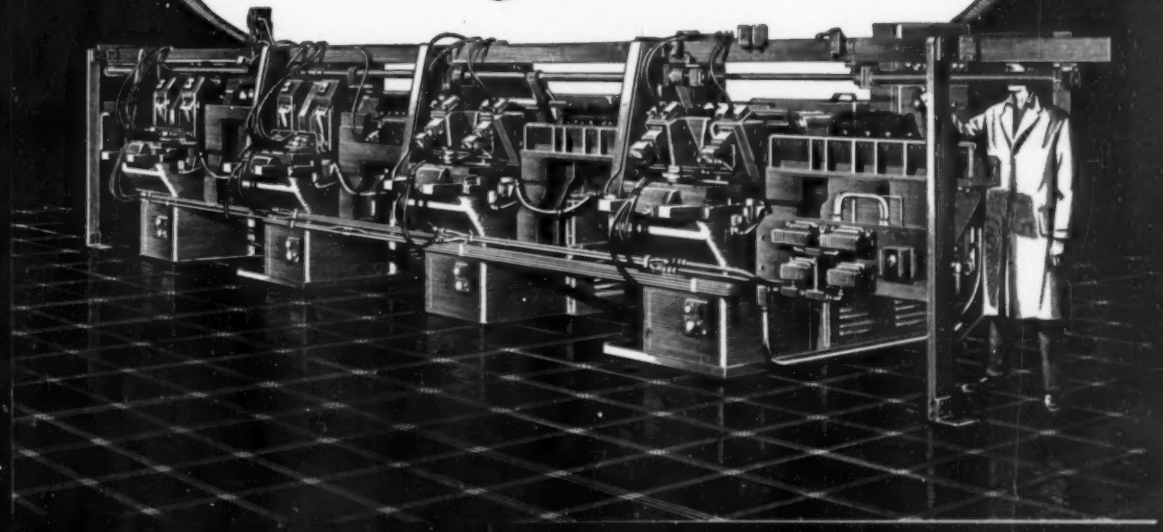
NB

What names come to your mind when you think of progressive manufacturing?

MOST of the ones you think of first have bought New Britain Automatics within the past few years for new and better ways of doing important metalworking jobs. The New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Conn.

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES

NEW BRITAIN
Automatics



Do you really know you couldn't do

Only CARBO

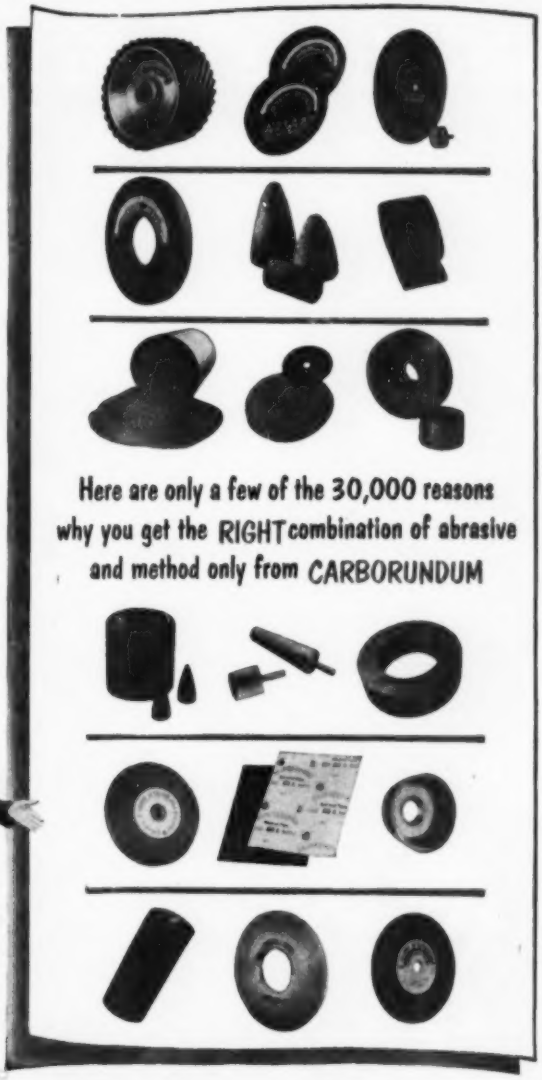
TRADE

it faster with an abrasive DISC?

A healthy skepticism is the profitable approach for you to take, nowadays, to every abrasive operation in your shop. The difference between a bad and a good profit factor can often be a new improvement in grinding, and new developments in this field are piling up daily under the crucial necessity of cutting costs without cutting corners.

If there's a faster, better way to perform any grinding or polishing operation, your CARBORUNDUM or distributor salesman is one man who's sure to know about it. Through him, and with his unbiased help, you can change your operating methods, if that seems indicated. Or you can change the abrasive you're using. Or both, or neither. The point is...both you and he are operating on *your* side of the desk—primarily for your profit, incidentally for his...not the other way round.

That's what comes of working with the man who represents the only complete line of branded abrasives, unsurpassed in scope, unexcelled in quality. So, today—call in the man from CARBORUNDUM: it's to your profit!



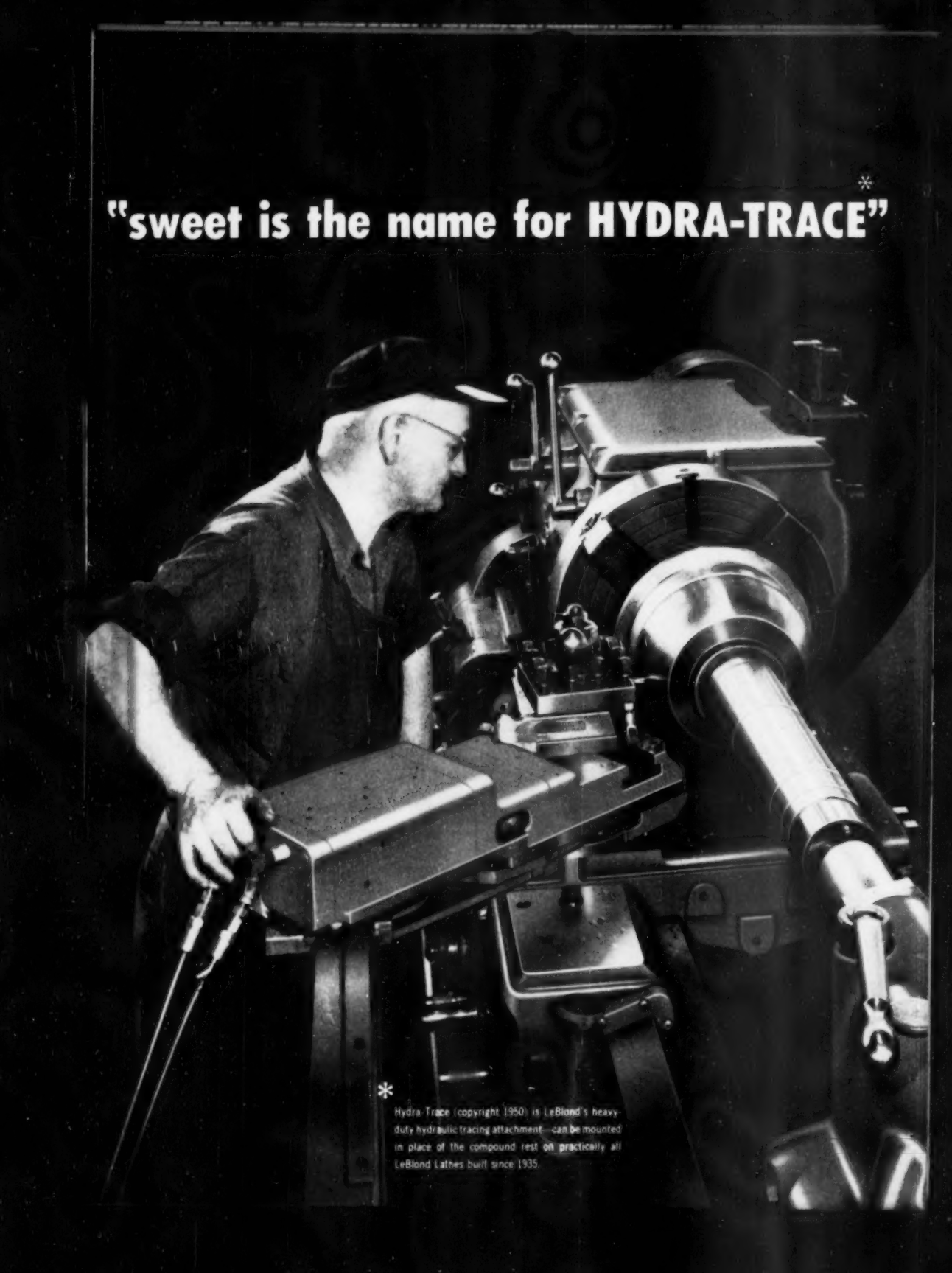
Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

RUNDUM

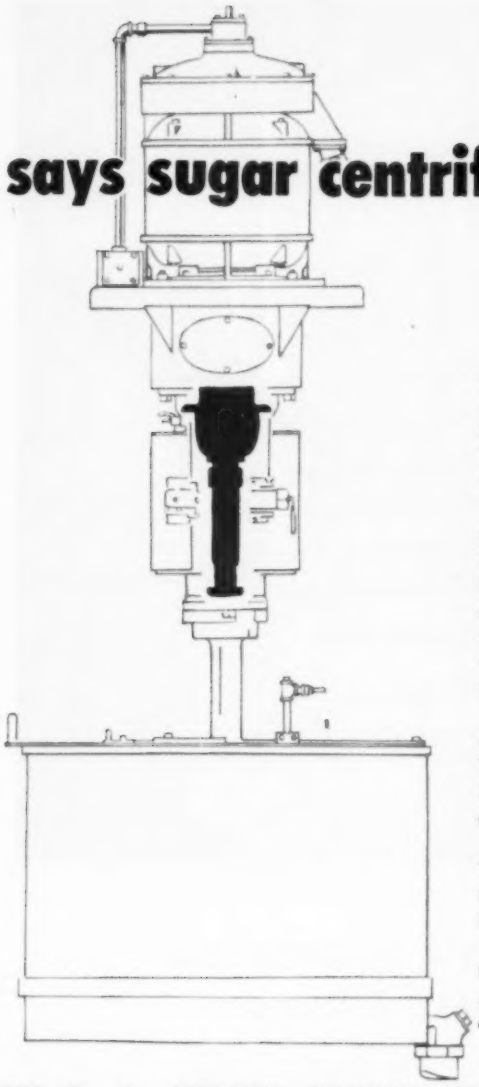
MARK

offers ALL abrasive products...to give you the proper ONE

"sweet is the name for HYDRA-TRACE"*



* Hydra-Trace (copyright 1950) is LeBlond's heavy-duty hydraulic tracing attachment—can be mounted in place of the compound rest on practically all LeBlond Lathes built since 1935.



says sugar centrifugal manufacturer

turning time cut 60% on contoured 3-step shaft

Centrifugal machines made by The Western States Machine Co. of Hamilton, Ohio are used in all corners of the world for the processing of sugar. Three years ago, this company had to speed up machining methods.

One important part, a contoured 3-step shaft—called a "ball and quill"—carries the thrust of the basket as it spins at 1800 rpm. The ball allows the basket to shift slightly, compensating for unbalanced loads. This part was first produced in the usual manner, which included turning the contour with a radius attachment, followed by tedious file finishing.

Then, on the recommendation of LeBlond's Cincinnati Distributor, E. A. Kinsey Co., a Hydra-Trace unit was installed on a 16" LeBlond Heavy Duty Lathe. The result was "sweet"—turning time cut 60%!

Sweet, too, were the other benefits of Hydra-Trace. No need for highly-skilled operators. Flat templates, made quickly, stored easily. Short set-up time. Heavy-duty capacity. Many more.

See how you can reduce to hours and minutes tracing jobs formerly measured in weeks and days. Ask your distributor or write us direct for the rest of the story on Hydra-Trace.

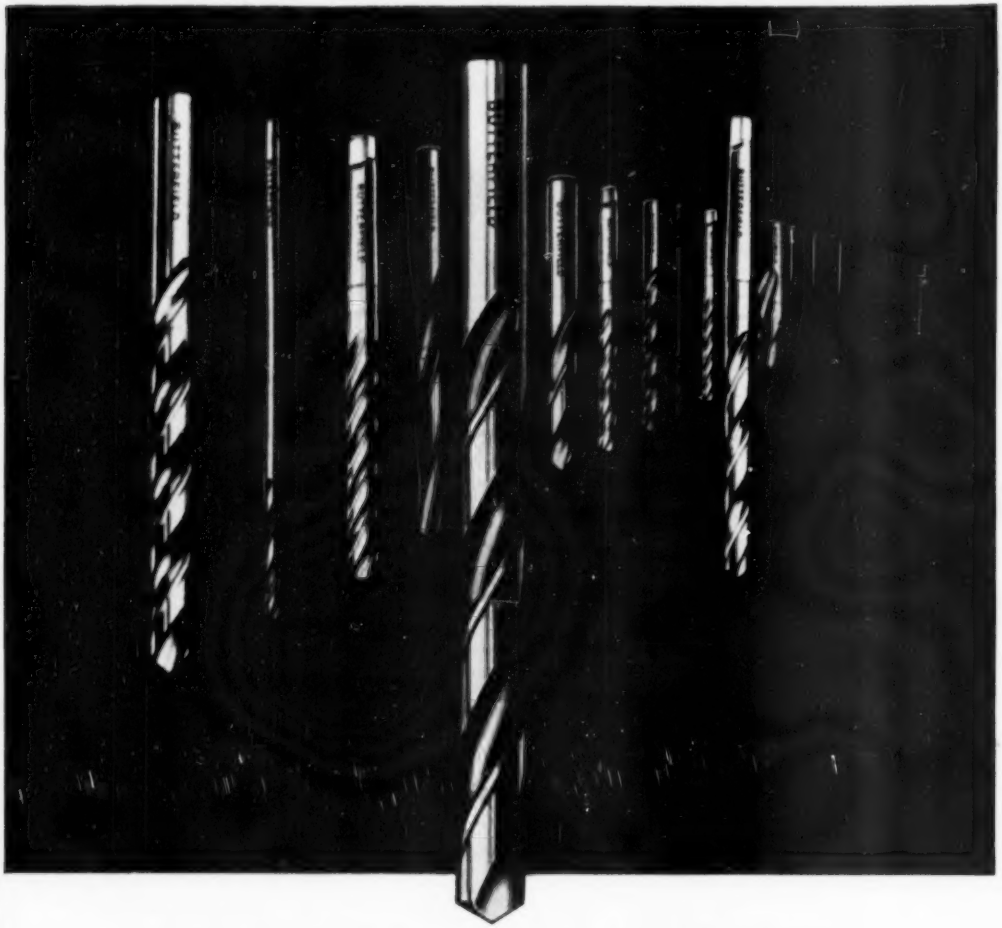
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for bulletin HT2A for complete details on LeBlond Hydra-Trace

turned faster by

LEBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*



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Butterfield Twist Drills Are Here — For Every Purpose. The Latest Additions To This Famous Line.

Now you can get twist drills of the same high quality as the Butterfield taps, dies and reamers that have served you so well over the years. As with all Butterfield products, each drill is individually inspected for accuracy and quality — 100% inspection for 100% satisfaction. Union Twist Drill Company, Butterfield Division, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.

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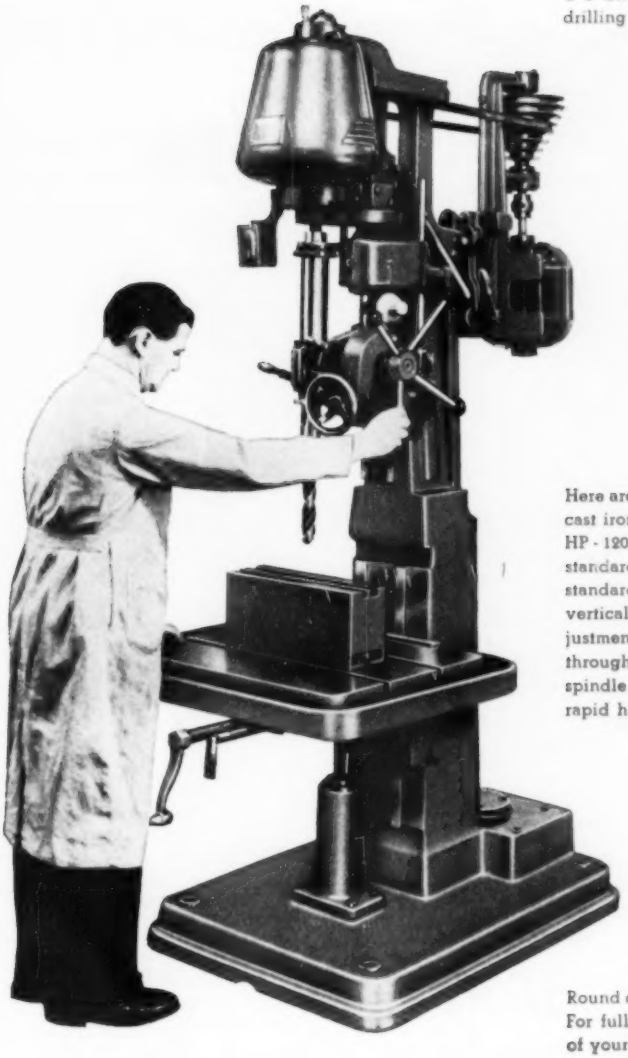
Bar stock being tested for microstructure . . . one step in Butterfield's 100% inspection.

SEE YOUR NEARBY BUTTERFIELD DISTRIBUTOR FOR PROMPT DELIVERIES AND SERVICE

tops for torque

. . . at all speeds and feeds with simple direct drive. C-O Cincinnati 21" sliding head drills handle hole drilling up to 1¼" diameter.



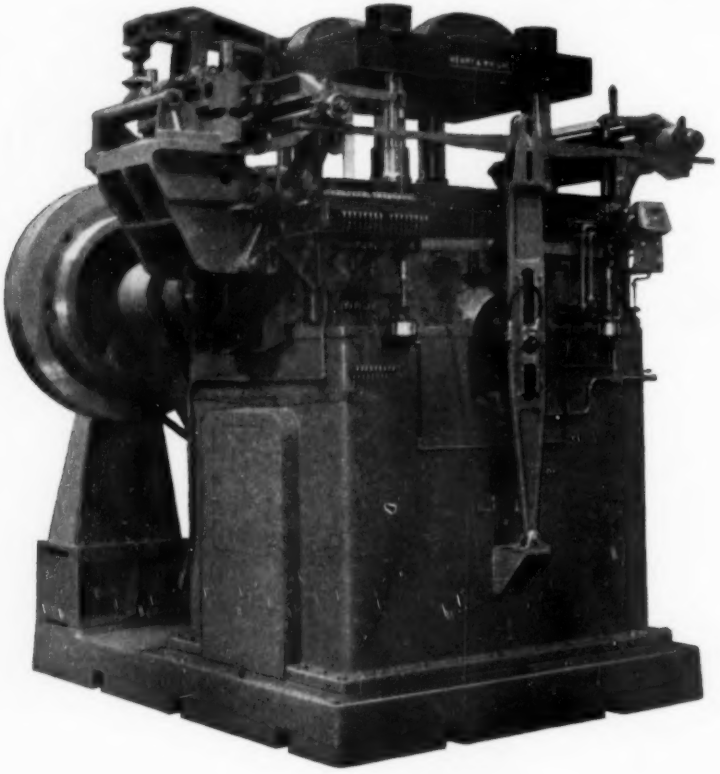
Here are condensed specifications: 1½" capacity in cast iron, 8 spindle speeds from 76 to 2025 using 2 HP - 1200 rpm motor, 4 power feeds — choice of standard, medium or high range, No. 4 MT spindle standard, No. 3 optional, 9¼" spindle travel, 8" vertical adjustment of sliding head, 15" vertical adjustment of table, heavy, close-grain iron castings throughout, full-floating drive — no belt pull on spindle, three methods of feed at no extra cost – rapid hand lever, sensitive handwheel, or power.

Round column and multi-spindle models available. For full details write for Catalog D-120 and name of your local dealer.

CANEDY-OTTO DIVISION

CINCINNATI 9, OHIO, U.S.A. **cincinnati lathe & tool co.**

New 350-Ton Henry & Wright



Right and left hand sections of housing for automotive window control gears. Replaced zinc casting. Produced from .065" thick hot rolled steel in coil form at rate of 60 completed pairs per minute. Steps performed with each stroke of machine: notch, pierce for pilots, draw, re-draw, strike and lance, lance for partial blank outline and pierce holes for shaft, bend ears at 90°, pierce and bend ears at 45°, close ears and form welding tabs, lance for partial outline, bend ears 90°, final forming, cut off one complete right hand and one left hand housing section.

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PLASTIC BOTTLES, RODS, TUBES, SPECIAL SHAPES

PLAX CORPORATION

Subsidiary of Emhart Mfg. Co.

HARTFORD 1, CONNECTICUT

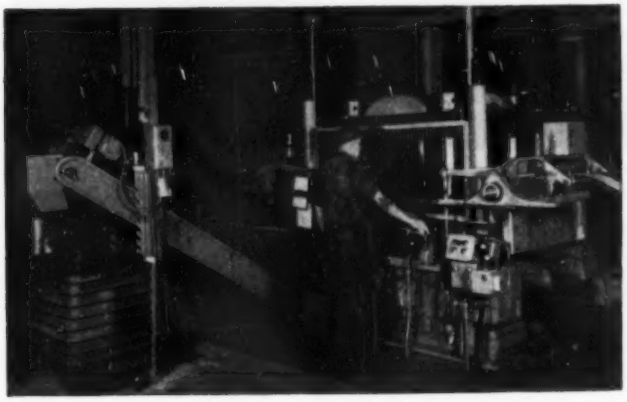
Dieing Machine *permits redesign of die-cast parts for more economical production via progressive stamping*

This newest addition to the Henry & Wright line of Dieing Machines broadens significantly the range of parts which can be produced complete-per-stroke with multiple-station progressive dies. It will produce completed drawn and formed stampings from medium and heavy-gauge sheet stock.

Up to 16″ strokes can be provided for producing straight shells up to 3⅞″ long and tapered or hemispherical shells of substantially greater lengths.

The lower crosshead is guided on exceptionally long ways, rigidly keyed in the lower base to provide precision alignment of tools throughout the stroke, even under severely eccentric loading.

Maximum tool protection is designed and built into the 350-ton Dieing Machine, which will handle material up to 25″ wide and 11/32″ thick. The same great features of other Dieing Machines are present, on enlarged scale, in this 350-ton beauty.



SAVINGS IN MANPOWER and production operations are manifest in this installation of the 350-ton Dieing Machine. One man attends the press, which automatically stamps complete parts out of sheet metal. Compare the economies of producing pieces complete-per-stroke at high speed via the Dieing Machine with the previous method of using zinc die castings.

Only the best is good enough

FACT PACKED CATALOG
Complete descriptions of all Henry & Wright Dieing Machines.
Write: Henry & Wright, 481 Windsor St.
Hartford 5, Connecticut.

HENRY & WRIGHT
Division of Embart Mfg. Co.

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Davis Stub Boring Tools with unfinished shanks

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Bore sizes 1¼" to 7" dia. for
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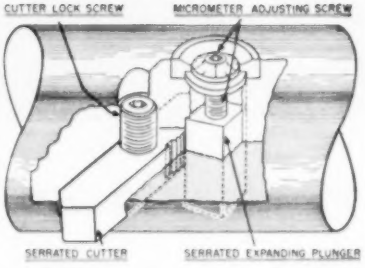
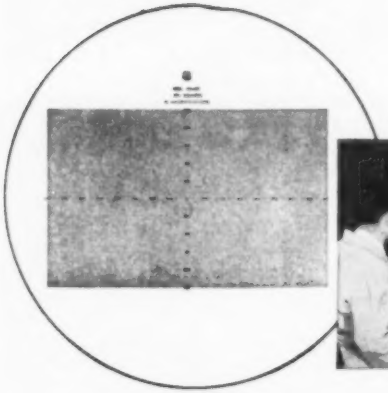
Stop "cut and try boring"—get more use from your machines... slash boring time . . . adjust to within .0001"

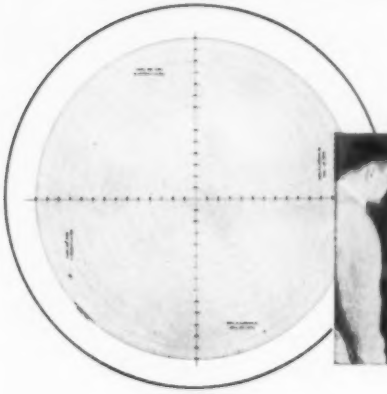
NOW get these Davis Stub Boring Tools with unfinished shanks and finish them in your own plant. Shanks are properly centered and prepared for turning. Tools are of same high quality as Davis Finished Shank Tools . . . heat-treated 4150 alloy steel, Rockwell "C" 28/32. They're designed for the use of High Speed Steel, Super High Speed Steel, or Tungsten Carbide tipped cutters. See your nearest Davis representative or write for Bulletin DB110.



Whatever your boring problem, if Davis can't bore it — it can't be done!

DAVIS BORING TOOL DIVISION
GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN, U. S. A.





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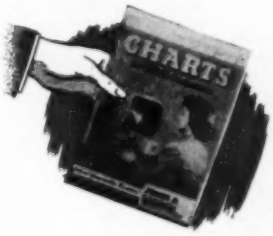

Write to Dept. 710 for your copy of our New Chart Catalog No. 471.

Optical Comparator Division

JONES & LAMSON

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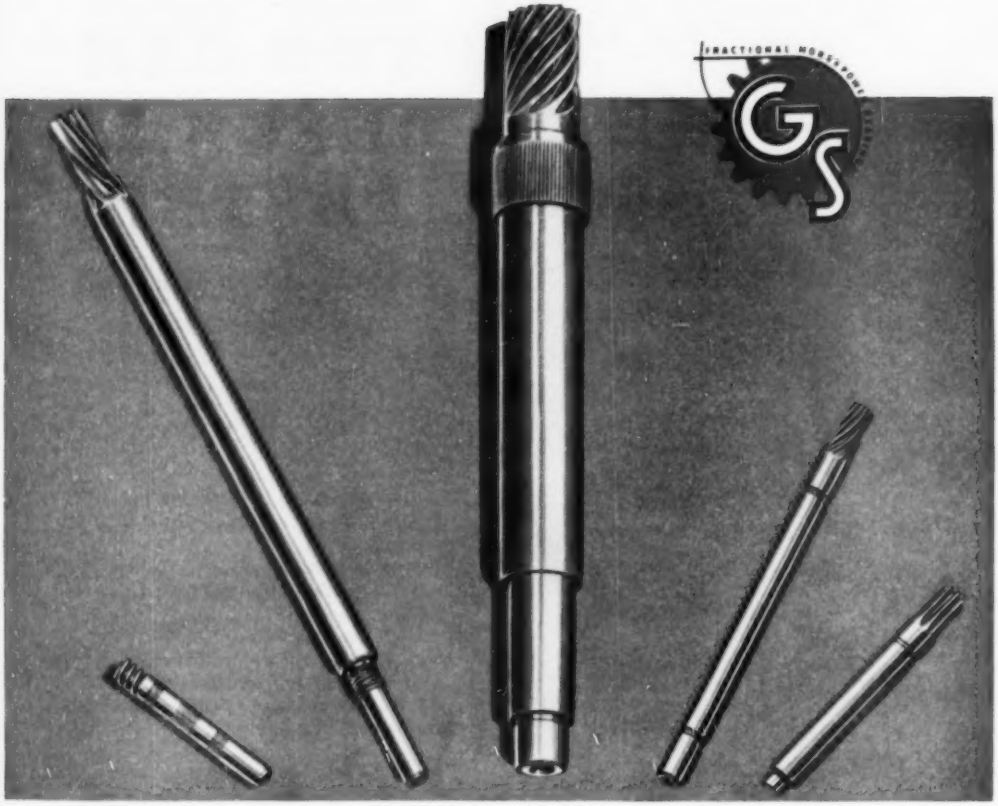
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835



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the G.S. 6-page illustrated folder. It describes and illustrates G.S. facilities, Small Gearing and applications, together with handy charts. Will you ask for it on company stationery, please? No obligation, of course.

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Hardinge Precision Ground Circular Cut-off Tools feature special steel, proper hardness, longer life, absolute accuracy, precision ground finish, standardized blade widths for various stock sizes, cut-off with or without chamfering, finish-gashed and sharpened ready for use.

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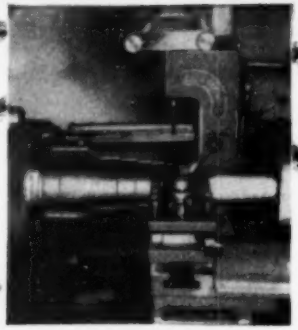


Canadian user reports

Lodge & Shipley COPYMATIC

...increases production 186%

...saves 65% of time

...combines versatility of the hollow spindle with the productivity of the Copymatic

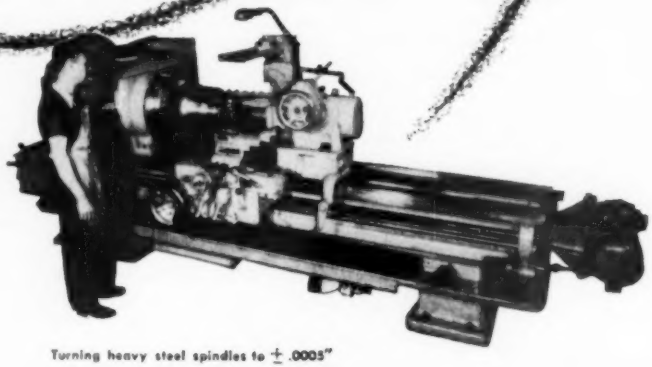
Here's still another on-the-job analysis of COPYMATIC accuracy and speed and Hollow Spindle Lathe versatility. Rough and finished turned inside and out, this heavy cast steel spindle comes down to 170 pounds finished weight with .0015" tolerance on diameters, ± .0005" on bearing diameters.

In the second operation, work is turned end for end and the small end of work-piece inserted in the Hollow Spindle.

Floor-to-floor time for complete turning and boring used to be 20 hours minimum . . . now it's only 7 hours.

Time and cost savings are reported by every one of hundreds of COPYMATIC owners surveyed. The convenience and speed of hydraulic duplication, combined with Lodge & Shipley "Model X" accuracy and versatility, make the COPYMATIC a profitable investment.

Ask your Lodge & Shipley representative to show you other case histories or write for Bulletin No. 675.



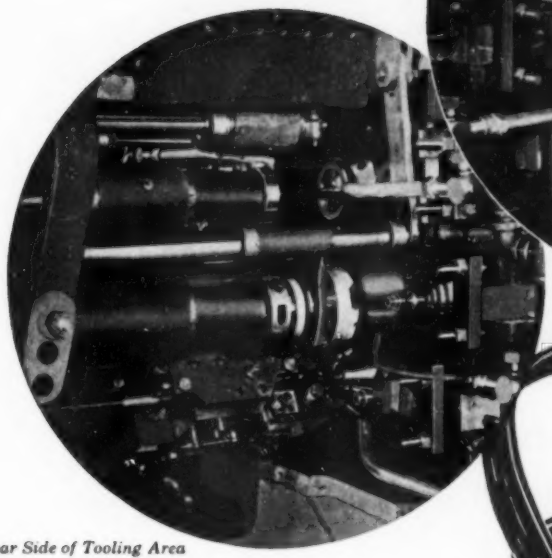
Turning heavy steel spindles to ± .0005" at Canadian Arsenals Ltd. Leaside, Ontario

THE Lodge & Shipley COMPANY

MACHINE TOOL DIVISION •
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

MORE IN ONE BASKET

Front Side of Tooling Area



Rear Side of Tooling Area

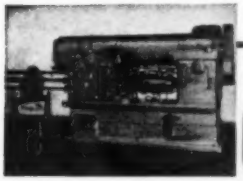
In producing the above part on a 1⅜"-SIX, the cycle time of 14 seconds per piece is not as important as the total time necessary for the entire run. Dependable performance pays.

The "automatic" has substantiated many of the advantages of centralized responsibility in metal turning.

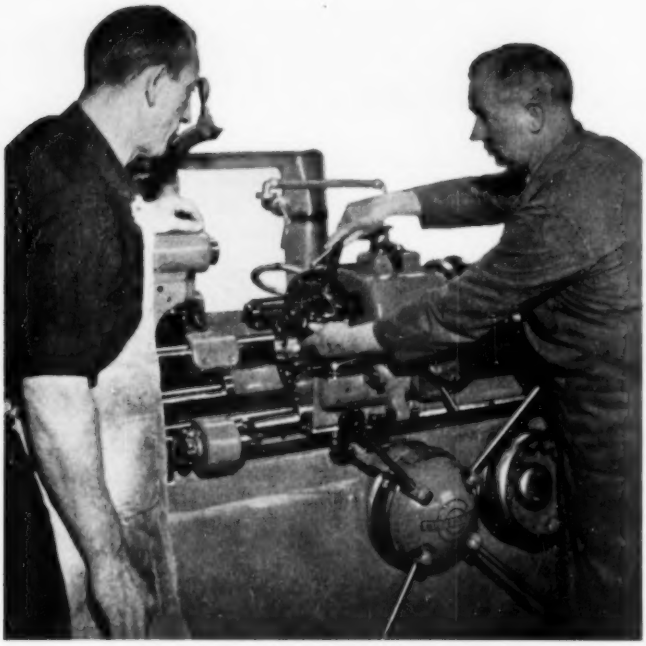
Even the earlier users realized that more work pieces can be profitably placed in one basket *if nothing upsets the basket.* Dependable performance has always been vital to the successful use of the "automatic".

The factors that determine the degree of dependability of an "automatic" are a very important part of its specifications. They are a part of the *complete* information available on CONOMATICS.

A Comparison of ALL Automatics is in Favor of Cone



Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



What kind of Servicing can you expect when you buy German Machine Tools?

MEET A TYPICAL ORBAN SERVICE ENGINEER AT WORK right in a customer's plant, setting up a Gildemeister Turret Lathe at Special Screw Products, Inc., Bedford, Ohio, and instructing operators in its use. Or it might be a Lindner Jig Borer at Ford—a Cawi Grinder at Thompson Products—a Klopp Shaper at Textile Machine Works.

He's typical of a staff of factory technicians permanently stationed at Orban—men who have actually built the machines they install, demonstrate and service.

Three Service Centers

These engineers work out of our service centers in Cleveland, Detroit and Newark, N. J., where replacement parts are stocked for all normal maintenance needs. Where a special part or attachment is needed in a hurry, our direct teletype connection with our Dusseldorf, Germany office can speed it on its way within 24 to 48 hours.

Actually, though, we've found that the hundreds of machines we've installed in major plants from coast-to-coast have needed little or no service attention after installation. In fact, our engineers have been able to devote some of their time and skill to servicing foreign tools purchased elsewhere.

Tools built to American standards

One thing more: Every machine tool we distribute is designed for standard American voltages and frequencies; calibrations and lead screws are in inches. Our written guarantee of materials and workmanship for a period of six months accompanies each machine. Complete operating instructions in English are supplied.

That's what you can count on when you buy machine tools from Orban. Ask us about your requirements.

Send for current stock list

Lathes	Grinders
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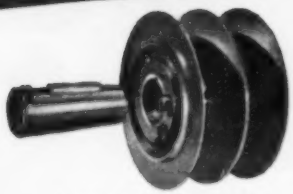
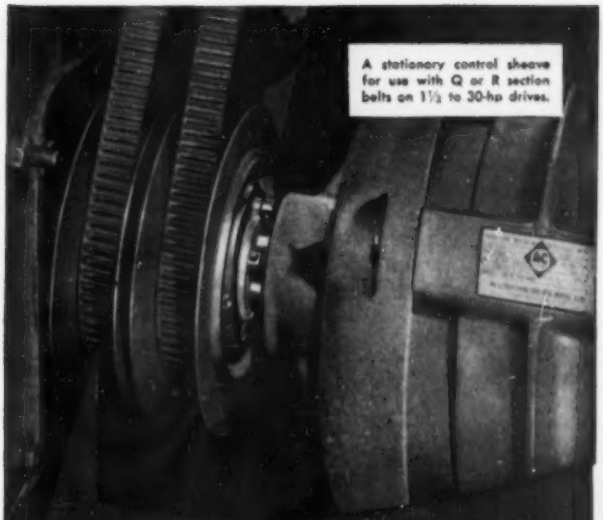




NOW!

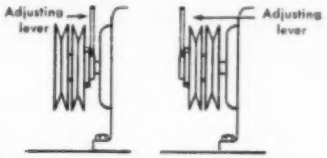
Wide Range Vari-Pitch Sheave has 3 New Advantages

1 Magic-Grip Mounting

The widely used *Magic-Grip* tapered bushing is now supplied with the Wide Range *Vari-Pitch* sheave, making it the fastest mounting sheave of its type on the market. Turning only one screw makes or breaks the vise-like grip of sheave bushing on motor shaft.

2 Fast Adjustment

To change sheave diameter — thereby changing speed — simply turn a single adjusting screw, *using a lever rod* that slips through a hole in the head of the screw. No more fumbling with screw drivers. Adjustment is fast and accurate.



3 Adjusts From Either Side

Sheave can be mounted on motor shaft so adjusting screw is either toward or away from motor bearing, as indicated above. This feature is especially important in installations where space for adjustment is limited. It's the only sheave of its type with this feature.

GET COMPLETE DATA FROM YOUR NEARBY ALLIS-CHALMERS DISTRIBUTOR OR DISTRICT OFFICE, OR SEND COUPON.

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Send me complete specifications and engineering data on the new Wide Range *Vari-Pitch* sheave . . . 20S7811.

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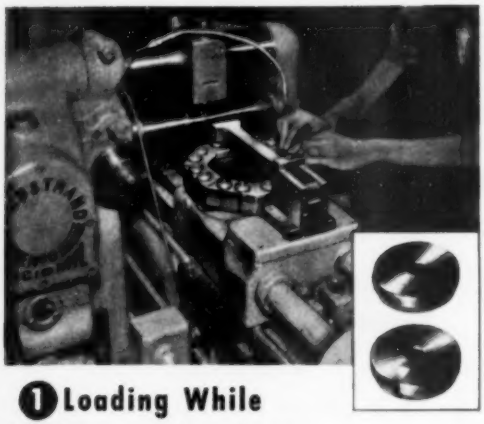
Texrope, Vari-Pitch and Magic-Grip are Allis-Chalmers trademarks.

ALLIS-CHALMERS

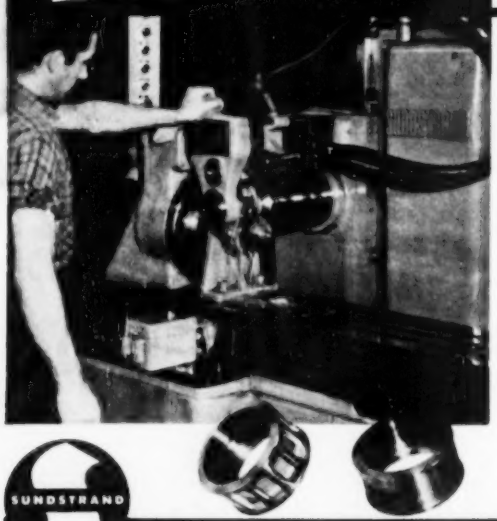
How SUNDSTRAND "Engineered Production" *Plus* Automatic Indexing Increases Production On MILLING JOBS

There are countless cases where the addition of a relatively simple attachment to a milling machine will increase production sufficiently to eliminate the need for purchase of additional machinery. This is often true with the addition of Sundstrand automatic indexing equipment. Milling problem solutions, like the five examples shown here, are the result of Sundstrand "Engineered Production". Call in a Sundstrand engineer on your milling problems. There is no obligation for this service.



① Loading While Milling, to Produce 800 Pieces Per Hour

This is a standard Sundstrand Rigidmil with standard automatic index base. The index base has 8 work-holding stations with 2 parts held in each station. Parts are located on pins and clamped and unclamped automatically with the movement of the machine table. As idle machine time for loading is eliminated, production rate of 800 pieces per hour can be obtained.

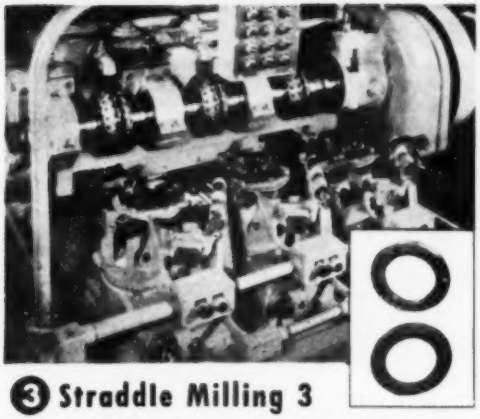


② Milling Multiple Surfaces With One Loading of Part . . . . Production Increased 22.5 Times

Here's a good example of the production possibilities available from an automatic indexing base and a standard machine. Milling time was cut from 3 hours per cylinder sleeve to 7.5 pieces per hour. This increased production is due largely to the use of a standard automatic index base in conjunction with a standard vertical feed attachment. These attachments provide a complete automatic cycle for milling 12 grooves in each cylinder sleeve.

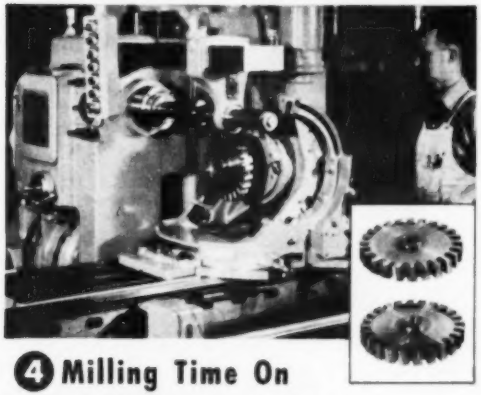
SUNDSTRAND

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



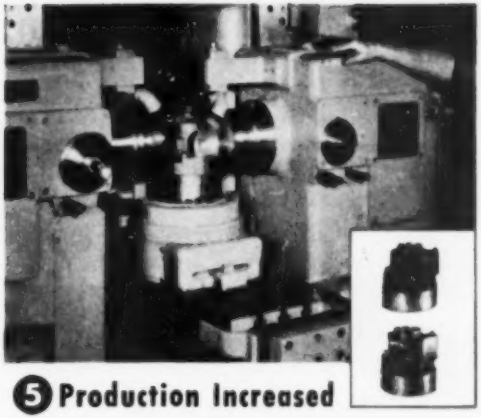
❸ Straddle Milling 3 Clutch Plate Lugs Per Machine Cycle . . . 240 Plates Per Hour

This is a special Sundstrand Rigidmil with 3 automatic index bases. The machine has a traveling head with a single spindle driving 3 sets of cutters on an arbor. The head cycle and indexing fixtures are timed so that each indexing fixture rotates 120° as the head rapid returns from a cut. One part with three lugs, straddle milled and slotted is completed each machine cycle.



❹ Milling Time On Cutter Bodies Cut 46%

This standard Rigidmil has a vertical power attachment for positioning the head and a universal type indexing fixture for milling tooth slots and chip clearance in cutter bodies. Fixture can be set 45° to the right or left of the horizontal center line and up to 10° past the vertical center line or a total of 100° movement. Pieces range from 4" to 14" diameter and lot sizes from one to eleven.



❺ Production Increased From 30 To 67 Pieces Per Hour With Duplex Mill And Automatic Index Base

Four surfaces of the cast iron compressor block shown are milled on a standard Model 22 Sundstrand Rigidmil. This machine is of the duplex type and provided with a Sundstrand standard Automatic Index Base attachment. In using the duplex type machine and providing an automatic indexing cycle, all four sides are machined in two passes of the table and one handling of the part. This results in greater accuracy and eliminates spoilage.

Production of this machine is more than double that of the unit replaced. It produces 67 pieces per hour at 85% efficiency. The old milling setup turned out 30 pieces per hour.

FREE Additional Data

For more information on Sundstrand "Engineered Production" on milling jobs, write for these booklets. Ask for bulletins 126.

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Machine Tool Company
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Blanchard Grinders, *with proper grinding wheels, can* and *do* give high production with extremely close tolerances for dimension and flatness. However, a No. 11 Blanchard user recently received erroneous advice on abrasive wheels from an outside source. The result was that 35 high-speed cam plates were ground on both sides in 1¼ hours with surface finish of 24 micro-inches.

By referring the problem to Blanchard, it was easily demonstrated that the No. 11, with correct grinding wheel, would give desired results—90 to 100 cam plates per hour, with surface finish of 4 micro-inches, dimension tolerance of ±.0002, and flat within 2 light bands.

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"PLEASE CONSULT THE ENGINEERS WHO DESIGNED ME, AND LET THEM SPECIFY THE CORRECT BLANCHARD WHEELS, SO THAT I CAN WORK FOR YOU BETTER, FASTER, AND CHEAPER"

Information on correct surface grinding procedure and wheel selection are given in "Work Done on the Blanchard" and "The Art of Surface Grinding." Write for free copies today!

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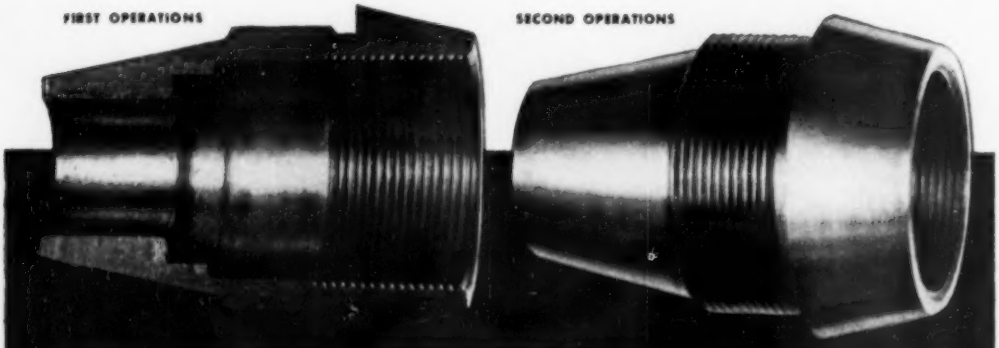

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for complete machining of this familiar steel job

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2. The secondary operations are done on a double indexing 8" eight spindle Acme-Gridley Chucking Machine (2 per cycle) at the rate of ..... **16 SECONDS**

Total multiple spindle machine time ..... **73 SECONDS**

A 2⅛" Namco Collapsible Tap and a 3½" five chaser Vers-O-Tool, both with ground thread chasers, cut the smooth 12 NF class 2 threads.

Here is another outstanding example of the economies that result from studied tool engineering co-ordinated with time-proved machine design—a combination for which The National Acme Company is justly famous. *Again we say:*

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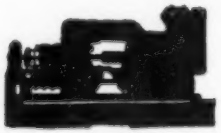

Whether for defense or civilian production, it will pay you to ask for Acme-Gridley's production figures on the work you are doing or contemplate. Send prints or samples.

The NATIONAL ACME CO.

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Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

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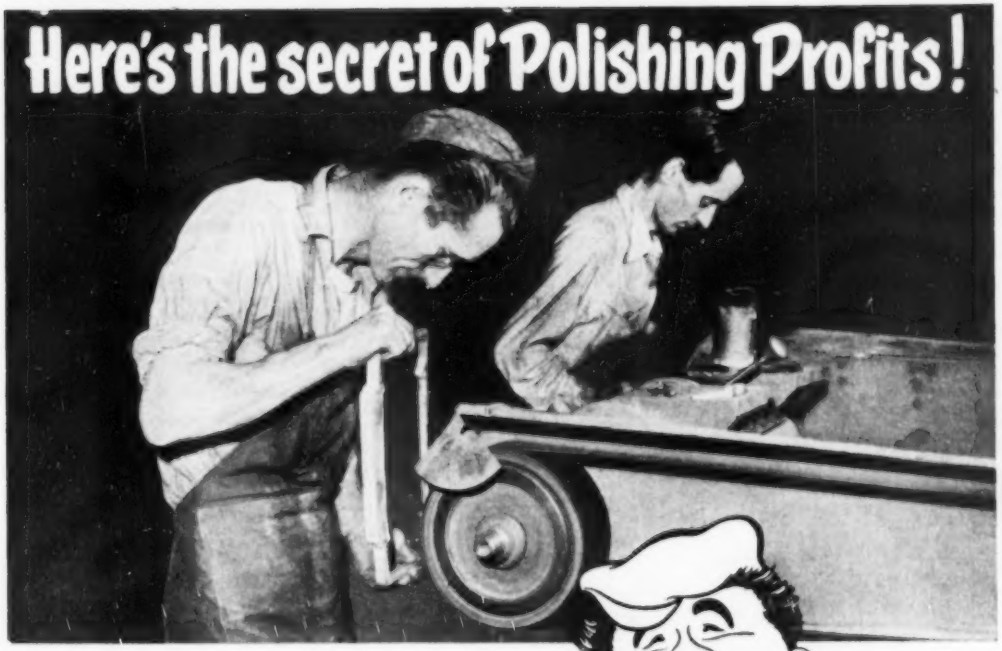

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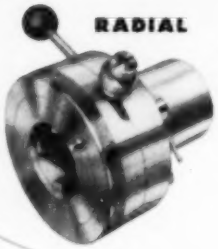

These Die Heads, with *ground thread* chasers, do an outstanding job on large or small lots, in pitches ranging from extremely fine to coarse multiple Acme.

They have an over-all capacity of from No. 8 to 4¼".

They require no more than the proper chasers to cut either right- or left-hand threads.

They are easy to install and simple to handle. For almost half a century of continuing development and improvement, J & L Dies and Chasers have been the answer to threading jobs throughout the world.

TANGENT

J & L Tangent Chaser Die Heads, with *ground thread* chasers, are rugged, dependable, time-tested tools. They are production engineered to produce better threads at speeds limited only by the material being threaded. Capacities are from No. 4 to 2".

There is a J & L Tangent Chaser Die Head engineered for your requirement. Stationary types are available for turret lathes or any machine where the tool does not turn. Revolving types are for automatic screw machines, drill presses, threading machines, or any machine where the tool is held in a live spindle.

For B&S AUTOMATICS and small Turret Lathes

For high production, quality threading on B & S Automatics and small turret lathes. Their simple design and careful workmanship assure repetitive accuracy with long runs between chaser grinds.

No. 16-S is for use on B & S No. 00, 00G, 0 and 0G and small turret lathes. They have "DUALIFE" radial type *ground thread* chasers with two cutting edges for maximum use between grinds.

No. 18-S is for B & S No. 0, 0G, 2 and 2G and the No. 19-S, with wider range, for B & S No. 2 and 2G. These dies use *ground thread* tangent type chasers.

Write to Dept. 710 for catalog!

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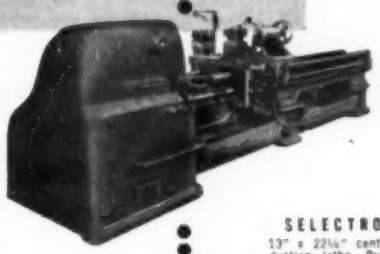


PEGARD

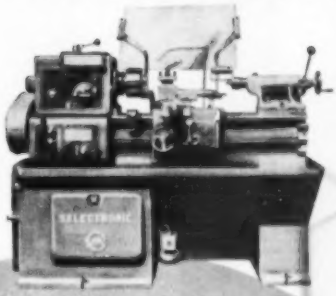
13" x 60" and 16" x 60" centers. Geared head Engine Gap Lathes, anti-friction bearing. Spindle speeds (16): 38-2000 RPM. Motor drive.*

23" x 80" centers. Geared head Engine Gap Lathe, anti-friction bearing. Spindle speeds (12): 6-1000 RPM. Motor drive.*

27" x 120" centers. Geared head Engine Gap Lathe, anti-friction bearing. Hardened and ground steel bedways. Spindle speeds (12): 6-1000 RPM. Motor drive.

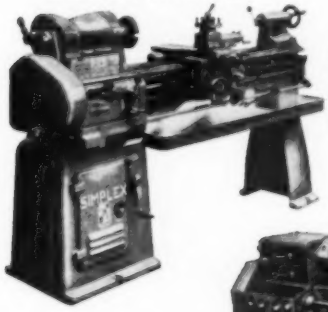
19" x 40" centers. Sensitast Precision Geared Tracer Controlled Copying Lathe. Spindle speeds (18): 27-2200 RPM. Motor drive.

*These machines are available with hardened steel bedways as extras.



SELECTRONIC

13" x 22½" centers. Production lathe. Pre-selector speed control. Spindle speeds (variable): 125-1000 RPM. Motor drive. . . Can be supplied with Hydraulic Copying Attachment (BONDYCOP).



SIMPLEX

14" x 30" and 14" x 40" centers. Engine Gap Lathes; quick change gear. Spindle speeds (12): 47-900 RPM. Motor drive.

AGRI

12" x 20", 12" x 30", 12" x 40" and 14" x 50" centers. Geared head, anti-friction bearing, quick change gear, Precision Engine Lathes. Spindle speeds: 60-1800 RPM. Motor drive.

In the wide range of precision engineered lathes illustrated and briefly described here, there are no doubt several that meet your urgent requirements.

BONDYCOP Hydraulic Copying Attachments are also available for *all* types of lathes.

Please write or call us for complete details regarding these fine machines . . . Measurements are in inches and decimals.

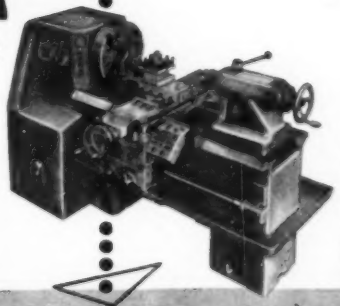
Morey Machinery Company has manufactured, imported and rebuilt high-grade machine tools for over 40 years...Your confidence will be well placed!

VIKING

13" x 30" and 13" x 40" centers. Engine Gap Lathes, anti-friction bearing. Spindle speeds (infinitely variable): 35-1200 RPM. Motor drive.

HAHN & KOLB

6" x 12" centers. Precision Bench Lathe. Spindle speeds: 250/2000 RPM. Motor drive.



MUELLER

19" x 40" centers. Production Lathe. Spindle speeds: 250-1500 RPM. Motor drive.

19" x 40" centers. Production Lathe, Hydraulic Tracer controlled. Spindle speeds: 250-1500 RPM. Motor drive.

24" x 30" centers. "Electromatic" Production Lathe. Spindle speeds (infinitely variable): 50-750 RPM. CONSTANT CUTTING SPEED. Motor drive . . . . Also available with Transverse Copying Attachment.

24" x 60" centers. Production Lathe, Hydraulic Tracer controlled. Spindle speeds: 50-560 RPM. Motor drive.

KERN

16" x 40" centers. Precision, Geared head Engine Gap Lathe. Spindle speeds: 48-1200 RPM. Motor drive.

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EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Double Standards

In reference to your Talking Shop item (*AM*—Nov 10 '52, p183), may I outline for you the practice in our plant concerning limits, as decided by our Tolerance Committee?

Basic purpose of limits on drawings is to obtain parts actually within the size specified. They do not include allowances for variations in measurements by operators or inspectors caused by inherent limitations of the measuring equipment and technique, although, in general, wider limits are applied for sizes difficult to attain and measure. In short, the limit on a drawing means what it says.

However, for inspection and salvage purposes, limits can be exceeded in many instances without the need for rework, but at the risk of some inconvenience or increased fitting at assembly. Amount beyond limits may be up to 20% of the limit range for dimensions in decimals, and 50% for dimensions expressed in fractions. These deviations are limited to use by inspectors and salvage committee, otherwise all others in the plant would think in terms of "double limits" for every dimension, which would be a dangerous philosophy.

Our tolerance committee comprises one representative each from Engineering, Shop, Quality Control, and Tool Design. Its function is to establish major policies pertaining to tolerances on drawings; it is not asked to settle individual problems as they arise.

It had been proposed that we should consider two sets of standards—one for Engineering and one for Inspection, but, as outlined above, we held to our standard practice. However, Engineering is now making a drive to liberalize tolerances on all new drawings, and to review existing drawings critically as opportunity arises.

Name withheld

Me Proud Beauty

Reference your item on the new car name (*AM*—Oct 27 '52, p97). How about "The Pretentious?"

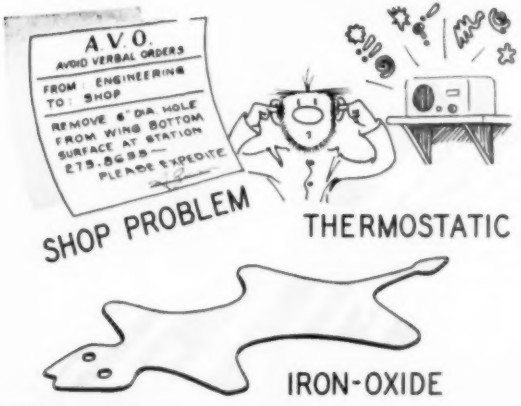
S Darmody
Buffalo

My guess is "Vainglorious."

P J Findlay
Cleveland

GRINETICS

By D. G. SMITH



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THROUGH MICROHONING . . .

PRECISION PRODUCTION THROUGH MICROHONING
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Diesel engines are chosen because of their dependable low cost power. The more precise the fit of parts, the more efficient the engine.

MICROHONING gives to functional surfaces of

- cylinder liners
- connecting rods
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- injector barrels
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accurate size, true geometry, and the characterized finish—all at production rates.

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Tooled for high production marking of small metal parts (12,000 pieces per hour), Model 347 illustrated above, is a good example of Noblewest's ability to keep ahead of industry's demands for constantly higher marking speeds at lower cost. Featuring a hopper and dial feed combination, parts are fed to the machine by the hopper, marked and automatically ejected. Spring pressure controls the depth of the mark and insures uniform depth of mark from piece to piece regardless of slight variations in diameter. Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality and with the all-important skill and know-how of master craftsmen. Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job faster, better, at lower cost. For complete details write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH
NOBLEWEST Roll-O-Matic MARKING
EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

Who Made 'Em?

Your article on ancient contouring lathes (*AM*—Nov 10 '52, p119) was extremely interesting, and I would like to know whether any such machines were built in the US. If so, who built them, and when? How were threads cut on these machines?

H R Roberts
New York City

As far as we know, these machines were never made here, but a number were imported. Makers were Goyen, Holtzapffel, Muckle, Birch, and Evans & Fenn. The Society of Ornamental Turners would be pleased to learn of the location of any such machines, together with the serial number and any available details of equipment.

Threading tools were comb-type chasers for internal and external work. Lack of space prevented our showing pictures of these tools.—Ed.

Stay or Go

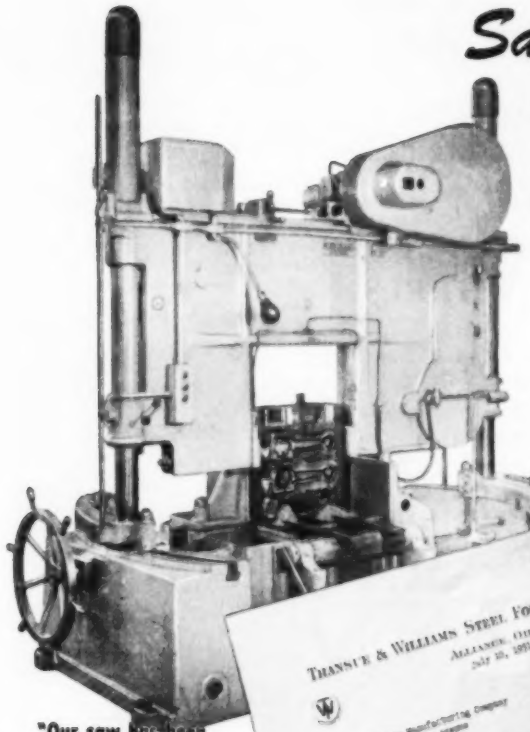
This guy, Bennet, has really got something there (*AM*—Oct 27 '52, p151). If more employers would realize the terrible "lost" feeling that a new man has when he is just pushed into a shop, shown a machine, and told to get to work, they would save themselves an awful lot of headaches.

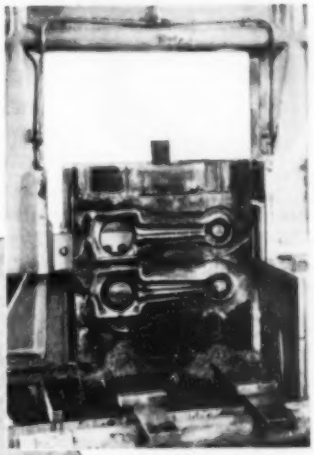
It costs money to hire a man, and it costs money when he leaves, and the little it costs to indoctrinate him properly at the start can be saved many times over if he stays.

There is no more horrible sensation than being put in with a lot of strangers and left on your own. You hesitate to ask the man on the next machine about payday—he is likely to make some sarcastic remark about doing some work before you get paid. When lunch time comes, the old hands get together in groups, either to open their lunch pails in the yard or to go to the cafeteria, and you are left alone, wondering where to go.

Even if the guy on the next machine is a good Joe, you can't keep

Save 25% Time in Re-facing Dies... 20% Time -plus steel- in Shanking Them





Trimming the worn impression from the face of a 20" x 24" die block with a No. 24 MARVEL Universal Hydraulic Roll Stroke Hack Sawing Machine. Average Blade Cost $.0108 per square inch.

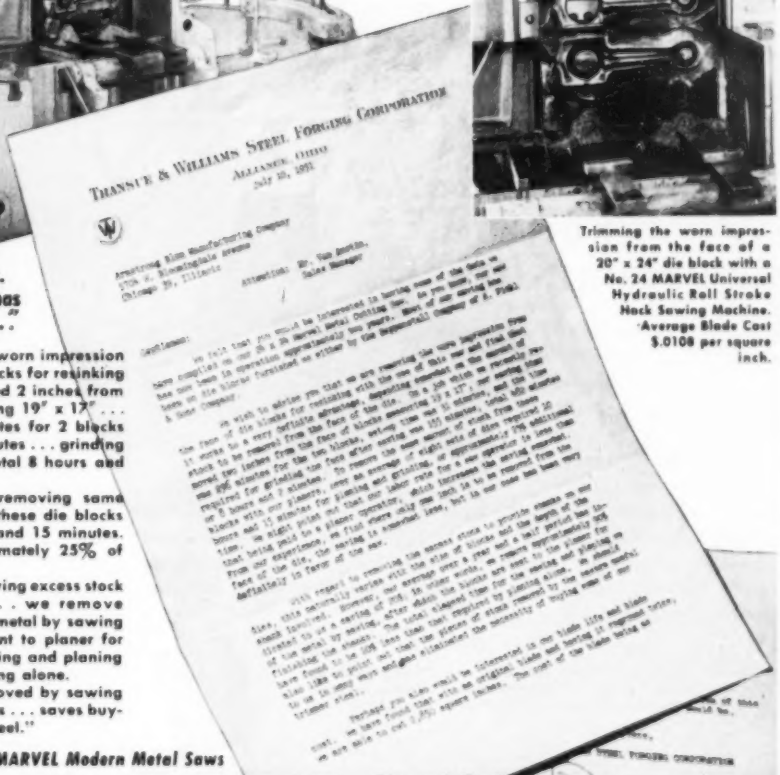
"Our saw has been in operation 2 years. Most of our sawing has been on die blocks..."

"We are removing the worn impression from the face of die blocks for reshaping ... we recently removed 2 inches from face of blocks measuring 19" x 17" ... sawing time 296 minutes for 2 blocks ... Set up time 31 minutes ... grinding time 155 minutes ... total 8 hours and 2 minutes.

"Average time for removing same amount of stock from these die blocks with planer, 10 hours and 15 minutes. Sawing saves approximately 25% of time ...

"With regard to removing excess stock to provide shanks ... we remove approximately 90% of metal by sawing after which block is sent to planer for finishing. Time for sawing and planing is 20% less than planing alone.

"Pieces of stock removed by sawing are useful in many ways ... saves buying of some trimmer steel."



TRANSUE & WILLIAMS STEEL FORGING CORPORATION
ALLIANCE, OHIO
July 10, 1952

Armstrong Blum Manufacturing Company
5700 W. Bloomingdale Avenue
Chicago 39, Illinois

Attention: Mr. Tom Smith,
Sales Manager

Gentlemen:

In fact that you would be interested in having some of the facts we have now been in operation approximately two years. Most of our sawing has been on die blocks furnished us either by the Pontiac Motor Division of G. M. C. & Steel Company.

We wish to advise you that we are removing the worn impression from the face of die blocks for reshaping with the use of this new hot final shape. It works to a very definite advantage, depending somewhat on the amount of stock to be removed from the face of the die. To a job which we recently received ten inches from the face of blocks measuring 19 x 17", our sawing time was 296 minutes for the two blocks, set-up time was 31 minutes, and the time required for grinding the two blocks was 155 minutes, or a total of 8 hours and 2 minutes. Over an average of eight sets of dies received for reshaping, our labor cost for sawing, set-up and grinding, or operation is approximately 25% of time we might put on a planer operator, which for a new operation is considerable saving. We find that our labor costs are approximately 25% less than those being paid to a planer operator, which for a new operation is considerable saving. From our experience, we find sawing is somewhat less, but is not much less than planing. Definitely in favor of the saw.

With regard to removing the excess stock to provide shanks on our dies, this naturally varies with the size of block and the depth of the face of the die. However, our average over a year and a half period has been approximately 90% of metal by sawing, after which blocks are sent to the planer for finishing the shanks. The total elapsed time for sawing and planing is approximately 20% less than the time required by planing to the same finish. We also like to point out that the pieces of steel removed by sawing are useful in many ways and save the expense of buying some of our trimmer steel.

Perhaps you also would be interested in our blade life and blade speed [illegible]. However, our average over a year and a half period has been [illegible] of the metal by sawing, after which blocks are sent to the planer for finishing the shanks. The total elapsed time for sawing and planing is approximately 20% less than the time required by planing to the same finish. We also like to point out that the pieces of steel removed by sawing are useful in many ways and save the expense of buying some of our trimmer steel.

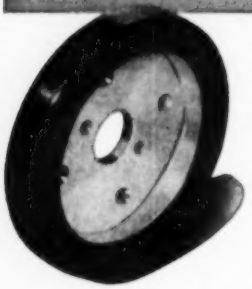
Perhaps you also would be interested in our blade life and blade speed [illegible]. However, our average over a year and a half period has been [illegible] of the metal by sawing, after which blocks are sent to the planer for finishing the shanks. The total elapsed time for sawing and planing is approximately 20% less than the time required by planing to the same finish. We also like to point out that the pieces of steel removed by sawing are useful in many ways and save the expense of buying some of our trimmer steel.

Write for Catalog of MARVEL Modern Metal Saws

Metal Cutting
MARVEL SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 W. BLOOMINGDALE AVE. CHICAGO. (39) U. S. A.

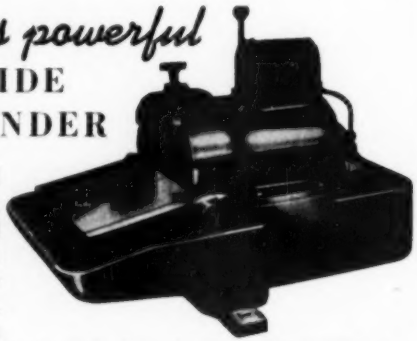
Grind More Carbide *per Carat of Diamonds*



...with STEEL-BONDED DIAMOND WHEELS

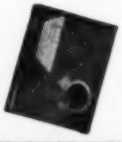
Wickman-Neven Steel-Bonded Diamond Wheels stretch wheel life—lower your carbide grinding costs because they're practically indestructible. They can't be damaged even by plunging sharp-pointed tools into them. Diamonds stay in place until worn to give more cuts per carat. These wheels also give up to 300% longer carbide tool service by producing a strong, uniform cutting edge that resists breakdown.

...and this powerful CARBIDE BENCH GRINDER



Ideal for all off-hand carbide tool grinding, the Wickman Model GF-2A is heavily built for years of service even by unskilled help. The 1 HP direct-drive motor is quickly reversed, and the wheel guard swivels for right- or left-hand grinding. A built-in coolant pump delivers 12 GPH; primer and strainer are also included. This machine comes furnished with a steel-bonded diamond wheel of your choice. Protractor also available.

write on your letterhead for this new 24-page catalog Resinoid-Bonded Diamond Wheels and Wickman grinders. For the Complete story on Steel-Bonded Diamond Wheels,



THE Wickman MANUFACTURING CO.

10325 WOODROW WILSON AVE. • DETROIT 3, MICHIGAN

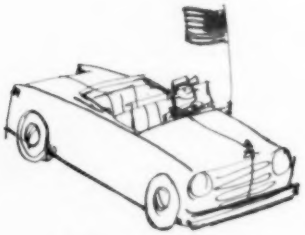
asking questions all the time, especially if it is piece-work, but where do you get lubricating oil? How do you get more coolant? How do you get tools sharpened? Are you allowed to make machine adjustments, or must you call a setup man? If so, who is he and how do you get him?

When you get home at night and your wife asks what you did, you don't want to have to say, "I dunno, I just cut slots in some steel blocks." How much better if you can say, "Oh, I slotted the cam-follower guides for the new engine we're building."

I don't care whether the president went to Yale or Harvard, but it is interesting to know that he was an All-American quarterback, started in the shop as a lathe hand, served in the army as a GI, or has a wooden leg to account for his limp.

It's the first few days that count. If you feel in that time that you belong, then you'll stay. But if you're still a stranger at the end of the week, you are going to start looking for some place where they treat you like a human being, not just a number on the payroll.

Richard Fitton
Detroit



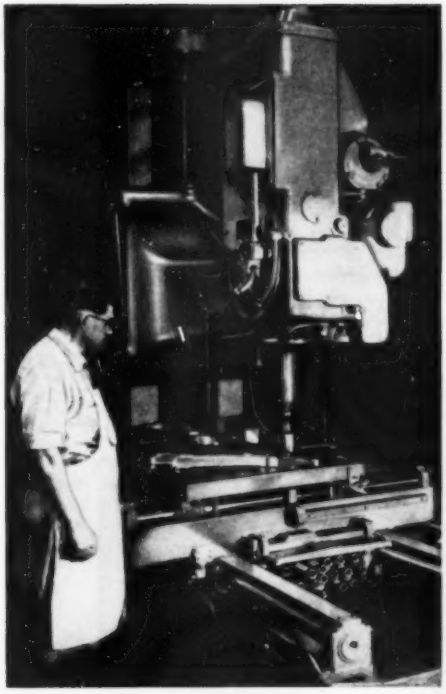
The American Way

Your editorial (*AM*—Oct 27 '52, p107) brings home, as few other articles could, the real advantages of our American way. Economic reports are all very well in their way, but a real, on-the-spot report of how the worker gets to work, and his ambition to "someday own a motorbike" shows how much better off we are here. We kick about high taxes and high living costs, and we grumble at paying 30¢ a gallon for gas, but at least we have something to show for it.

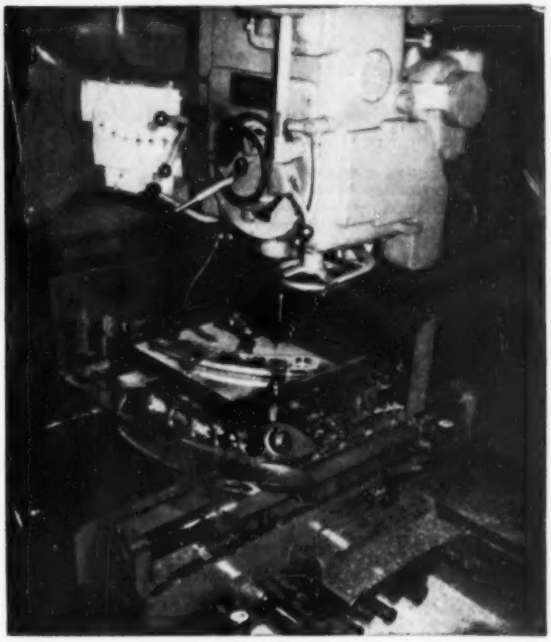
There's one big advantage we have here. It doesn't matter what we make, we always have a reasonable chance of owning one of what we make, if we want to.

L R Wentworth
Wilkes-Barre, Penna

JIGLESS ACCURATE DRILLING



Precision production work without the use of jigs, at Lockheed, is now being accomplished on the Cincinnati Bickford PRECISION Drilling Machine, equipped with a Bullard Man-Au-Trol Spacer. A variety of production jobs, such as cutting holes approximately 3" in diameter, through curved plates of magnesium about ⅛" thick, are now being economically produced without the use of jigs. First, a 5/16" hole is used as a pilot hole for a fly cutter. The total tolerance on the diameter of the accurately located holes is .001". According to Lockheed, "Fast, repetitive drilling is handled without the use and expense of jigs — heavy parts including castings are automatically positioned under the jig boring type spindle — parts handling is minimized — storage and maintenance of drill jigs are eliminated."

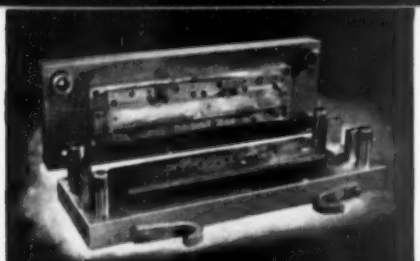


Where repeated accuracy of hole spacing, drilling, reaming and tapping is to be economically facilitated, the combination of the SUPER SERVICE PRECISION Drilling Machine and the Bullard 30" x 20" Spacer is hard to beat. Not only is production speeded — there is no waiting for jigs to be made. You can get into production of vitally needed parts right away.

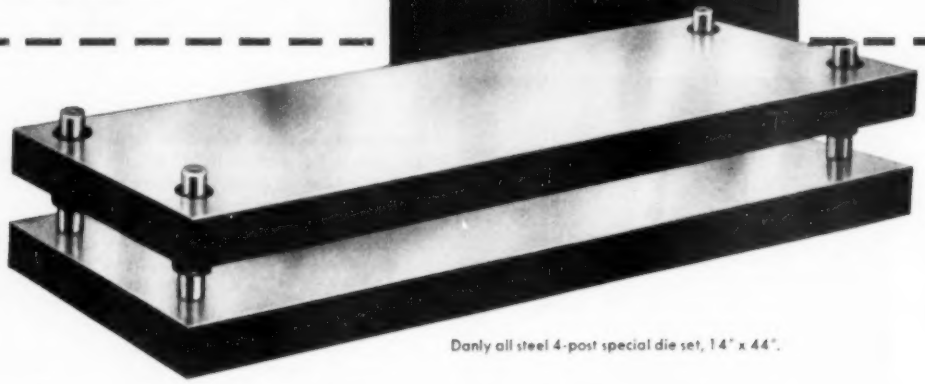
Ask the Cincinnati Bickford Tool Company, of Cincinnati 9, Ohio, or the Bullard Company, of Bridgeport 2, Connecticut, for further information about this natural combination.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

DANLY SPECIAL DIE SETS



Completed die for blanking a Nash door component—built for longer die life in a Danly all steel 4-post special die set



Danly all steel 4-post special die set, 14" x 44".

help Nash meet close production schedules!

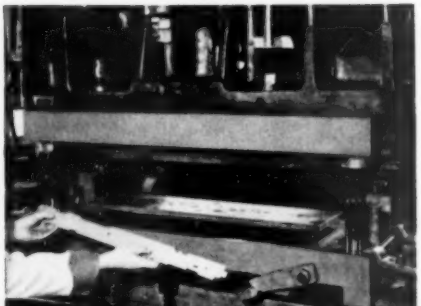
Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT —CALL YOUR NEAREST DANLY BRANCH

***CHICAGO**	50	2100 South Laramie Avenue
***CLEVELAND**	14	1550 East 33rd Street
***DAYTON**	7	3196 Delphos Avenue
***DETROIT**	16	1549 Temple Avenue
***GRAND RAPIDS**		113 Michigan Street N.W.
INDIANAPOLIS	4	5 West 10th Street
***LONG ISLAND CITY**	1	47-28 32th Street
***LOS ANGELES**	54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE	2	111 East Wisconsin Avenue
***PHILADELPHIA**	40	511 W. Courtland Street
***ROCHESTER**	6	33 Rutter Street

*Indicates complete stock



View of die shown above mounted in 150 ton press at the Seaman Body Plant of the Nash Kelvinator Corporation in Milwaukee, Wisconsin.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

SPOT NEWS of Metalworking

- **First all-dome railroad cars,** made for the Milwaukee Road, will seat 68 in upper section, 28 in lower with kitchen below, too. Adequate headroom is possible because lounge and kitchen sections are sunk lower than usual in railroad cars. Pullman-Standard is making ten of them on current order.

- **Brazil is taking up jet planes, too.** One item is 70 Gloster Meteor fighters bought recently from England in exchange for cotton. Another is announcement by cabinet officer that Fokker of Holland may produce several jet models in existing plant at Rio de Janerio's airport. Meteors bought were evidently overruns not wanted by RAF and OK'ed for sale.

- **Two new aluminum alloys have been announced** by Alcoa. Both are experimental materials with high rigidity and strength—suitable for ship superstructures and trailer-truck frames. Designations are XA54S and XC65S. Full tests have not yet been completed.

Engineer shortage is making things easy for recent and future college graduates. Average number of interviews made by seniors at one engineering school was 7½ last year, will go up this spring. Altogether 236 companies have visited this campus to seek the 140 June graduates for this year.

- **Sand compacting may locate new industries** where soil would not formerly support heavy buildings and manufacturing vibration. International Minerals & Chemical Co has a $12-million plant in Florida where pipe shells were sunk in sand, more sand was added and tamped by vibration, and pipe gradually withdrawn. Result is sand pillars within the ground.

- **Continuous galvanizing process for sheet-metal production** provides accurate thickness of zinc and stronger bond. Result is that galvanized steel can be press-formed after galvanizing, which is much simpler and cheaper than coating after forming operations.

- **Wood-composition material can improve drop-hammer operation.** Panels made from cheap hardwood and kraft paperboard, ⅛ in. thick, are placed around base dies to provide a firm buffer with elasticity. On one job eight sheets were located; result was 95% of corner wrinkles in formed product were eliminated. Material can be annealed and formed to contours, probably even for heavy drawing presses.

New data on nickel electroplating gives more concrete information on which expected results from a given treatment can be based. Tests by National Bureau of Standards in Washington show that most important factors in nickel electroplating are nature of the anode and properties and additives in the electrilyte. Temperature and current density have been found to have less effect on the quality of finished plate.

- **Swiss machine business is dropping,** though not alarmingly. Most war orders have been worked off, and German competition is moving in. Best customer in '51 was Brazil, which is not buying as much equipment now. Sales to France and Argentina are almost nil. Machine-tool and electrical-machinery builders are working hardest now.

- **Freight aircraft are due for design changes.** Leading authorities now favor detachable cargo sections, available only on experimental craft right now, that will permit much higher utilization of the expensive parts of a plane—the engines, controls, and wings. Objective is plane that will carry 75,000 lb over the North Atlantic at 300 mph at a cost not over 4¢ per ton-mile.

- **Future cooperation between auto makers and machine-tool builders should improve,** as result of special deal between builders and Dodge. Success of tryout (see Detroit Page) indicates that usual troubles with drawings, specifications, and engineering data, which is not usually exchanged completely, can be cut drastically. Dodge built up engine line for new model in short time mainly because tool builders gave them specs on machines before the machines themselves were delivered, allowing beforehand engineering in the plant.

CONTINENTAL Makes Both to Suit Your Requirements

The form-relieved milling cutter at the left above has a ground form, while the cutter below has an unground form. Both are easily sharpened by grinding the faces of the teeth.

If limits are within plus or minus .001", if the form has several angles or radii, or if the job requires a fine surface finish, then we recommend the ground form. The grinding operation corrects any distortion caused by heat-treatment, insuring an accurate form and a true-running cutter for a good work finish. However, if tolerances are not too close and the form is not too intricate, you can save money by using unground form-relief cutters.

Continental, being a division of Ex-Cell-O, supplies the tools used by Ex-Cell-O for the volume production of precision parts for aircraft and other industries. This work provides an exceptional opportunity to try out various tool designs and materials and to determine definitely the best tools for today's production needs.

These facts can mean real savings to you. Call in your Ex-Cell-O representative or contact Continental in Detroit today for information on Production-Proved Cutting Tools.

In this group of special Continental tools are ground and unground form-relieved cutters, flat form tools, an offset carbide tipped tool and a double-end carbide tipped spot-facer.

DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

52-16

Washington

Sit tight on new plans that require government backing of any kind. This is not the time to bring them to Washington.

You can get routine decisions on pending business—like a contract you've been negotiating, a supplemental metals allotment, a pricing-order interpretation. But where higher policy is involved, you can't get answers.

• • •

There's more behind it than mere politics. Many top bureaucrats feel morally bound to avoid major policy shifts that'll tie the hands of their Republican successors. There's also feeling that such decisions would be reviewed, possibly changed after Jan. 20. Result: more confusion.

So Washington is standing pat. The much-publicized "transfer of power" is really a briefing on major problems for a few top people of the incoming administration. Big decisions will hang fire until next year.

• • •

Take metals controls, for one thing. Steel producers want CMP dropped immediately. They want to set aside some output for military, AEC, and defense-supporting programs, then open their books to everyone.

Top mobilizers want to take it slower. CMP will stand as is for first quarter. Then carbon, sheet, and strip steel will be freed in second quarter.

• • •

There's plenty of time for a decision on decontrol. Second-quarter allotments won't go out until about Jan 25, just after the new administration takes office. Then steel mills have until Feb 15 to place orders.

NPA claims it's getting pleas from railroad-equipment builders, engine and turbine makers, and other users of heavy plate and bar to take it easy on decontrol. They don't want to compete for their steel now with military contractors.

• • •

You can be sure there'll be some sort of material control after June 30. Mobilization officials are already drafting a new controls scheme, and they think the Republicans will buy it. Here's what they'd like in a new law:

Continued broad authority to allocate materials that become scarce because of military demand. A quantitative measure—perhaps 10%—would be set as minimum military and AEC take for any one material as justification for control.

Where military and AEC take is less, there'd be only limited priority aid to defense-supporting programs. This would relieve types of pressures on defense agencies that broke down the old DO-rating system.

The new law would define "military-connected" projects, not directly military-financed, that could get spot aid. Then there'd have to be specific Pentagon or AEC endorsement.

• • •

BPA or a successor civilian agency would allot steel, copper, and aluminum to military or AEC contractors. Mills would be required to give these orders priority, then be able to sell unrestrictedly to civilian consumers.

Allotments would be a strict limitation on the military take. The harness would be put on to prevent the pile-up of inventories—a distinct likelihood when the military gets its head.

This "military CMP" would be more specialized than "open-end CMP." Under the latter, all metals users submit needs, allotments are made only for military and AEC, then everyone scrambles for remaining supplies. That way, most civilian industry won't get tied down with paper work. Only biggest metals users would have to report consumption periodically, so they could adapt themselves again to CMP in a hurry, if needed.

• • •

GM's Charles E Wilson takes over the Pentagon with more handicaps than his predecessor. As Marshall's deputy, Lovett played a big role in running Defense Dept's business side while Marshall ironed out military matters with the joint chiefs. Wilson takes over tough problems without benefit of that experience.

Wilson's first job will be the military budget. Though he didn't sit in on its preparation, he will have the job of explaining it to Congress.

Unification is another headache. Ike's Baltimore speech set the stage: Eisenhower wants some real unity among the services, or else. Typical thing Wilson will put a stop to: Air Force brass making an end run to Congress for more money after the Pentagon's said "No."

• • •

War: Though taking advice from joint chiefs of staff, Wilson will have the tough job of running an unpopular war in Korea. There's already considerable agitation from top brass for an all-out Spring offensive on our part to force a military conclusion to the Korean War. If the joint chiefs recommend it, Wilson will have to find the forces to fight such a war, then supply and equip them.

Defense procurement: Wilson is certain to give the military's hidebound and archaic buying practices a thorough going over. He's had to deal with Pentagon red tape as the largest contractor to the military. Wilson will push for a unification of procurement regulations and practices — not a three-way interpretation of the armed-services procurement act of 1947. He'll force through single-service buying, too.

SHEFFIELD
A. G. D.
SNAP GAGES
NEW PRICES
STOCK DELIVERIES
The magnitude of current defense procurement pyramided on unprecedented civilian needs has made it practicable for Sheffield to more than triple its manufacturing facilities for standard A.G.D. gages . . . and to put them on a mass production basis.
Mass production methods have reduced manufacturing costs as they normally do. Mass production coordination has made it possible to build up complete stocks of standard gages and maintain these stocks at full quota.
Sheffield's policy is to pass its manufacturing savings on to you in reduced gage prices. Thus you can now have Sheffield Quality at a low price and without waiting.
See your representative or write us. Your quotation will go forward as soon as we know your requirements. Get them in the mail today.
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GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS
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In Australia, the Sheffield Corporation of Australia Pty. Ltd., Melbourne

Detroit

The auto industry is delighted over appointment of C E Wilson as Secretary of Defense. Autodom figures that having the General Motors president in the cabinet means a strong voice in support of its contention that, once allocations are made for military needs, civilian companies should be allowed to scramble on their own, not be limited by quotas. That would result in more materials for auto plants, more production.

• • •

Detroit is urgently seeking more production. Auto sales at retail in the fourth quarter have been well above seasonal expectations. Field stocks are down to a point that there is no cleanup problem preceding new-model introductions.

• • •

Outlook for 1953 is brightening. Detroit is figuring 1953 will be second only to 1951 volumewise. Some authorities look for assemblies next year to total above 7 million units, 6 million or so being passenger cars. Current rate is 150,000 a week or so.

Such optimism may be why car prices are not advancing from 1952 ranges. All Chrysler Corp divisions have not announced; they've held the price line. So has Kaiser-Frazer, and so has Packard, latest to tell price structure.

• • •

Regarding Chrysler, incidentally, Dodge division has told how it was able to get its new engine tooled for current volume (while others which began earlier were having bad troubles). Dodge persuaded machine-tool producers to turn over engineering drawings, specs, and available components to the company. These were farmed out wherever possible. Small machine and parts companies took them, completed them.

One noteworthy example: Three automatic tunnel broaches for the engine block. They require 1113 tungsten-carbide planer tools along their 159 ft of length. These were completed in no more than seven months.

Ford's engine plant at Cleveland has a big broaching operation, too, for initial machining on blocks coming in from the adjoining foundry. Pads, top and bottom, bearing cuts, and other sections are broached about as fast as you can say "transfer machines are wonderful."

• • •

Detroit employment stands on the Board of Commerce index at 162.0 as of Oct 31. This is the highest level reached on the index (the period 1935-39 equals 100) since May 1951.

The scarcity of draftsmen and junior engineers is aptly indicated by this remark from an executive engineer: "We give applicants a pencil sharpened at one end. If they know enough to put the sharp end on the paper, we hire them on the spot!"

With help so hard to find, many companies are giving more dignified names to hitherto prosaic jobs. An example of the high-faluting semantics of this sort is found in some Ford plants, where "payroll analysts" are at work. Hitherto they had been known as timekeepers.

• • •

Prices being paid by automobile companies for steel products continue to crawl upward—some price increases accruing from the steel strike of last summer have not yet come through, inasmuch as suppliers have not yet themselves received new orders at the higher prices. The upward creep is expected to continue on this account till the first of the year.

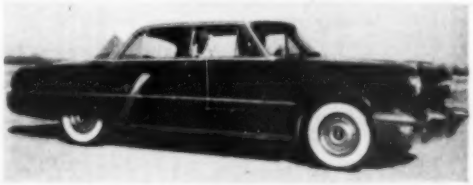
Prices for non-ferrous and non-metallic items, meanwhile, are steadying down. The auto buyers see an element of competition, a desire to keep capacities operating wherever possible, that is serving as a stabilizing influence.

Automobile buyers are expressing satisfaction at the way the malleable-iron-price quotations have stopped gyrating. Some feel malleable prices are now about as predictable as grey iron.

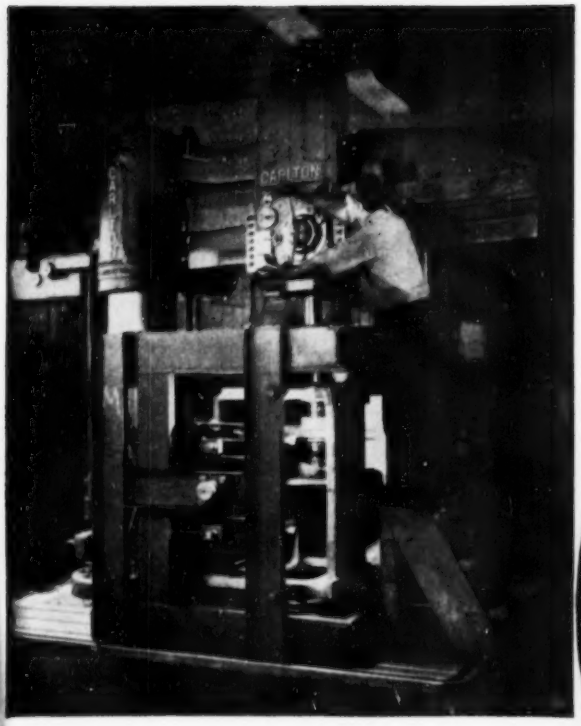
• • •

The biggest scurrying in many months by accessory producers is getting into production on wire wheels and wire-wheel facsimiles. Sets which are factory-equipment optionals will retail at between $200 and $300. Supplier companies, marketing through jobber channels, have approved production runs of size enough to bring the price down to the $100-$200 bracket.

Still others are experimenting with stampings on which spoke designs would be embossed; the problem is to paint out or otherwise eradicate the non-embossed sections permanently enough that pebbles won't destroy the pattern in a few weeks of driving. If anybody is able to solve that one, imitation wire-wheel sets might get down around $10 or so.



LINCOLN'S '53 MODELS LOOK LIKE LAST YEAR'S, BUT the insides are plenty different. Hp rating is 205, with compression ratio at 8.0 to 1. Carburetor is four-barreled, there's a new manifold intake, new combustion-chamber shape, and a straight-through exhaust system. Prototype's speed was clocked at 117 mph. Optionals include power steering, power brakes, and four-way front-seat adjustment



Carlton customers

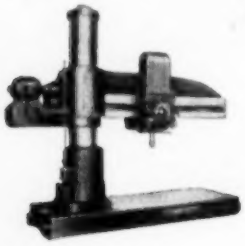
GET HOLE DRILLING EFFICIENCY AND ECONOMY!

CARLTON RADIAL DRILLS provide generous capacity and tremendous power, yet are extremely accurate. Miller Printing Machinery Co., Pittsburgh, says:

"When compared to the ordinary drill, this huge Carlton radial (above) is gigantic and yet it is precise and accurate."

THAT PRECISION COMES FROM enlightened Carlton designing, engineering and manufacturing . . . and from an intimate knowledge of your radial drill requirements acquired in sixty years of experience.

Be sure to check Carlton before you buy your next radial drill. Ask for descriptive bulletins today.



Carlton

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

Machine Tools

A special Defense Department appropriation for procurement of long-lead-time production equipment for reserve purposes is to be sought by the White House.

It will be asked for in President Truman's budget for fiscal 1954, which will go to Congress the week prior to inauguration in January.

The program will be in line with a recommendation made by the Advisory Committee on Production Equipment (the Vance Committee) in its interim report to Defense Mobilizer Henry H. Fowler, which was released Nov 25.

• • •

Said the committee: "If an adequate defense position has to be maintained over an extended period of time . . . a larger productive capacity to produce military end items must be created and maintained. Then it can be quickly expanded in event of an emergency by merely adding manpower and hours of operation."

The government has not disclosed how much money will be needed to set up the standby production lines. But Mr. Fowler said "it will not be tremendous."

The Vance Committee is now preparing its final report, which will contain more detailed ideas about the production-equipment reserve. The interim report was made to permit insertion of the special appropriation request in the budget before submission to Congress.

• • •

Alfred Neate, deputy director of machine tools, Ministry of Supply for Great Britain, and G. Nichols, personal assistant to the director-general of machine tools, have been visiting machine-tool builders in this country the past month. They are returning to London this week.

They have been discussing with US builders the delivery of machines for the British defense-tooling program and also the effect of the stretchout over there on total requirements.

• • •

The British apparently find that some 346 US tools destined for installation in war plants in the British Isles will not be needed. Of that number, 124 have already been delivered to England and are in storage awaiting assignment to specific plants.

Only 26 machine tools of the 346 have been cancelled. But the British are attempting to cancel another 37 machines.

All of the 346 machines are being offered by the British to other Nato countries for their defense projects or to Washington for our own program. If the British are not successful in disposing of these "surplus" machines, they will keep them and perhaps work them into later defense needs.

Mr Neate, by the way, is reported to be tagged to become the director-general of machine tools before long.

• • •

The shell-production program in Europe, which will be part of the offshore procurement plan for the coming year, will run to about **$250 million.**

The tooling for this program, as reported earlier in this column, may involve both US and foreign machine tools.

A Portugese arsenal is about to be equipped with new machine tools. About $1.2 million will come from this country, and perhaps $750,000 from European builders.

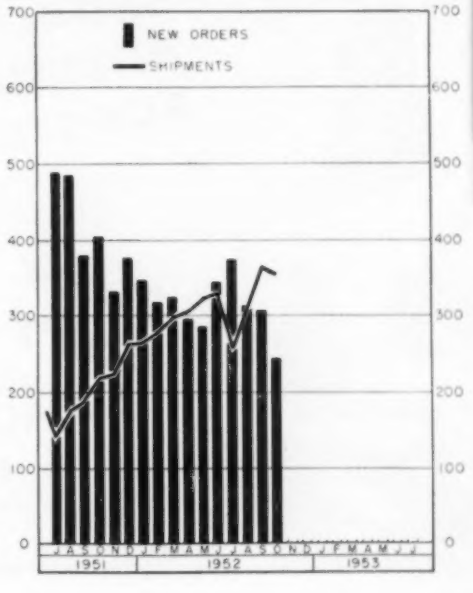
A Belgian builder of a shell lathe of new design has been in America trying to interest US companies in the possibility of making his product over here. Main drawback is that the market is so limited.

• • •

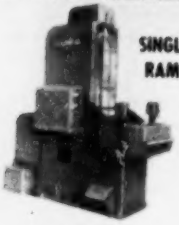
General Services Administration is revising pool contracts to clear repayment terms in case of cancellation. GSA wants to include profits in settling with machine-tool builders. Department of Defense objects. Final decision on this important point is expected shortly.

BF

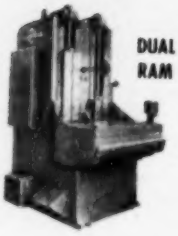
Machine-Tool Orders Continue To Drop



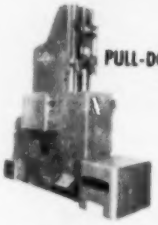
95% OF ALL BROACHING JOBS CAN BE HANDLED BY ONE OF THESE COLONIALS



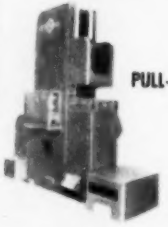
SINGLE RAM



DUAL RAM



PULL-DOWN



PULL-UP

HYDRAULIC PRESSES

UNIVERSAL HORIZONTAL

PRODUCING 13600 SPLINES PER HOUR

1 MACHINE WITH 2 BROACHES FINISHES 7 FACES ON 3 CASTINGS

TWO MACHINES BROA SEVEN SURFACES ON TANK TRACK PART

CUTS 3 OPERATIONS TO 1

COMPLEX CONTOURS EASILY PRODUCED BY BROACHING

BROACHING PARTS AFTER ASSEMBLY

COMPLETELY MACHINES CONNECTING ROD BIG ENDS ON ONE DUAL RAM

CUT COSTS 57%

SIX OPERA... PERFORMED in 1 PASS ... 1 BROACH ASSEMBLY

MACHINE 7 DIFFERENT PARTS IN 60 SIZES ON ONE MACHINE

"BLIND" SURFACES CAN BE BROACHED TOO

TURN OUT PARTS IN PRODUCTION TO T

BROACHING LARGE INTERNAL GEARS BOOSTS OUTPUT

294 Teeth in Thirty Minut

STOCK VARIATIONS DON'T BOTHER THIS MACHINE

NEW DYMON-IZE GROUND BROACHES GIVE SMOOTHER SURFACE FINISH

BROACHING ELIMINATES SEPARATE OPERATION ON PART

CH
MAKE ONE BROACHING MACHINE DO THE WORK OF 3, 6 OR MORE MILLING MACHINES
COMPLICATED PARTS MACHINED WITH TWO BROACHES ON ONE COLONIAL MACHINE
BOOST SPROCKET PRODUCTION 300%
SHUTTLING TABLE CUTS LOADING TIME ON PULL-DOWN
BIGGER BROACHING MACHINES FOR BIGGER JOBS
AIR OPERATED ECCENTRIC FIXTURE SIMPLIFIES BROACHING OF STEERING KNUCKLES
PRODUCE SPLINE FITS WITH "ZERO" BACKLASH
SURFACE BROAC
SIMPLIFIES MACH
OF COMPLICATED
BROACHING SPLINES IN A BLIND HOLE
BROACHING
FOUR SURFACE
SIMULTANEOUSL
OOL ROOM PRECISION
12 SURFACES, 8 BORES, FINISHED IN ONE SETUP EACH OF 2 BROACHING MACHINES
QUICKEST WAY TO PRODUCE LARGE TAPERED SPLINES
ARE YOU GETTING THE MOST OUT OF BROACHING?
Shown here are random headlines out of recent issues of "BROACHING NEWS", published by Colonial in the interest of helping industry cut costs.
With competitive costs becoming more important every day, you cannot afford to overlook what Colonial can save you with UNIT-ENGINEERED broaching installations: Machines, broaches, fixtures, handling equipment.
If you haven't seen a copy, let us know.
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BROACH CO. DETROIT 13
AUTOMATIC FIXTURE ON HORIZONTAL TRIPLE-SLOTS CLUTCH HUBS
TYPEWRITER CARRIAGES ARE BROACHED TOO
uses ONE Broaching Machine to broach 59 parts

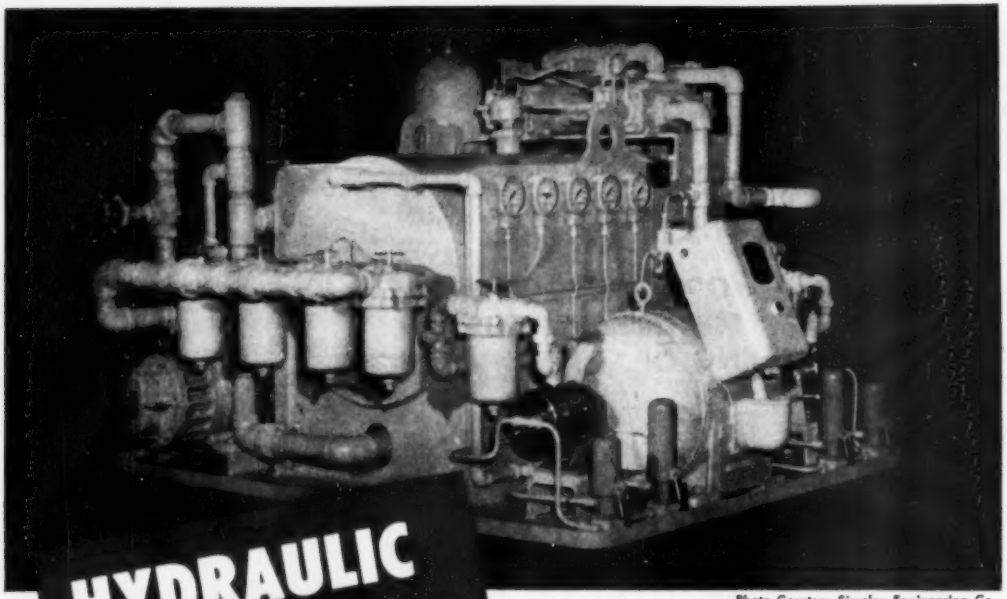

Photo Courtesy Simplex Engineering Co.

HYDRAULIC PUMPS LAST LONGER...

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Whatever use you make of hydraulics, make *Texaco Regal Oil (R&O)* your hydraulic medium. One user* reports: *"Texaco Regal Oil (R&O) has kept our hydraulics systems clean . . . enabled us to maintain a non-stop production schedule. We have never had a shutdown due to rust, sludge or foam. Pump wear has been negligible."*

Texaco Regal Oil (R&O) is a turbine-quality oil specially fortified and processed to prevent sludge, rust and foam. Tests show *it has more than ten times the oxidation-resistance of ordinary turbine-quality oil.* With *Texaco Regal Oil (R&O)* you can count on smooth, uninterrupted operation, longer pump life, lower maintenance costs. There is a complete line of *Texaco Regal Oils (R&O)* approved by leading hydraulic manufacturers.

For machining, use *Texaco Cutting, Grinding and Soluble Oils.* Whatever the metal or the method of working it, you can do it better, faster, at lower cost with Texaco.

Let a Texaco Lubrication Engineer help you select the proper Texaco Lubricants to give you the best results at lowest possible cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

*Name on request

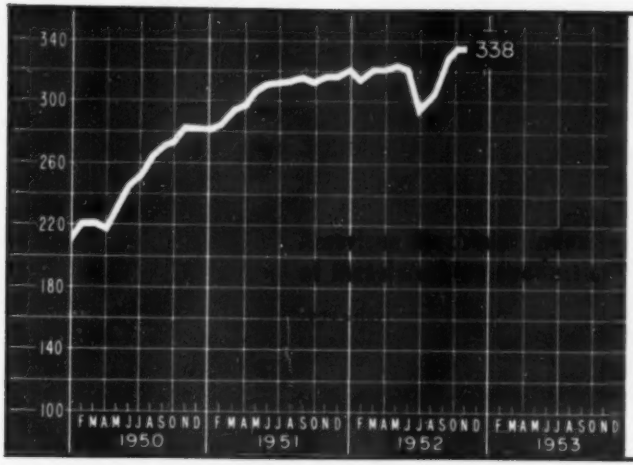
TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

Faithfully yours 50 *for Fifty Years*

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE, on television Tuesday nights. METROPOLITAN OPERA radio broadcasts Saturday afternoons.

Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV '52(*)	OCT '52(p)	SEPT '52(r)	OCT '51
	338	**338**	**330**	**306**
Total Index	**338**	**338**	**330**	**306**
Machinery	**308**	**303**	**306**	
Electrical Machinery	**398**	**383**	**348**	
Autos	**248**	**242**	**217**	
Other Transportation	**570**	**550**	**440**	
Other Metalworking	**331**	**325**	**308**	

(*) Estimated (p) preliminary (r) revised

New administration will keep business healthy. That's the general thinking of many in metalworking, although it can't be traced to anything specific. Tax relief, which won't come off til '54 to any great extent, is a reason mentioned, but it isn't a valid one.

Another trend may be gradual deflation, according to some management planners. Metalworking activity is sure to be high next year, but order backlogs will slip, and are doing so now. High competition next year and higher output because of modernization may allow production to catch up with demand more quickly than expected earlier.

• • •

Methods, tooling, and equipment are due for changes in many industries that haven't had a chance —or inclination—to do much modernization since the post-war slack period. Thus, the tooling market is swinging to service in replacement and improvement. Most major tooling-up programs are well along now—some completed —as indicated by generally smaller tooling orders, despite higher current costs.

• • •

Steel is a major problem with railroad shops. There are new orders for many freight cars, some passenger cars on the books, and more inquiries coming in all the time. Backlogs are stretching out past the middle of next year, but expected steel shortage may last through next quarter.

• • •

Western metalworking expects big '53, with most industrialists polled in recent survey convinced dollar volume for first quarter in '53 will be as good as or better than first and last quarters of '52. Concensus of opinion is also that orders, employment, inventory of finished products, and dollar volume of finished products would be same or up this year.

• • •

Ball-bearing production is down because of few orders. This one is technological unemployment—customers have changed specs to better bearing alloys and increased bearing lives.

Small-tools source sees good business "unless we talk ourselves out of it."

• • •

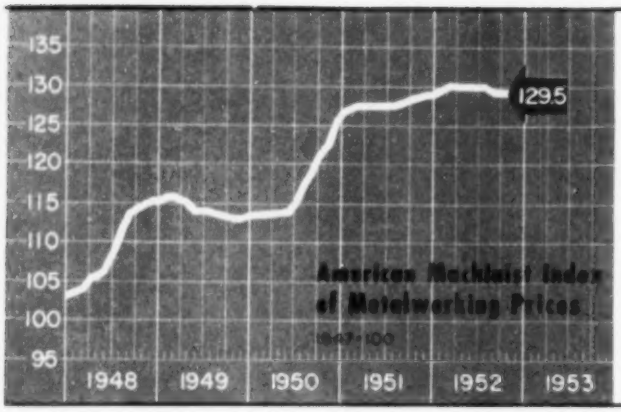
The steel industry plans on making 100 million ingot tons for civilian use next year, plus 15 to 20 million for military use. That compares to 96 million ingot tons, total, in '49. Hardest-to-get items in immediate future will be wide-flange beams, heavy plate, large rounds, alloys—particularly electric-furnace grades, and some carbon products.

Higher chromium production will probably be set off by recent OPS ceiling push-up. This includes chrome steels. Stocks of refined copper are up from last month, indicating a slight easing of that market. Expansion goals for nickel have been upped to 190,000 short tons (up 58,000) and for molybdenum ore and concentrates to 70 million lbs (up 12 million) by NPA.

• • •

Scrap's troublesome again. A decline in scrap stores at the mills, if it continues, might cut early-'53 steel output. Supplies are still good now, but scrap collection drops during the winter and this trend may promote a new drive.

Gaging Business



PRICE INDEX

	NOV '52 (*)	OCT '52 (p)	SEPT '52 (r)	OCT '51
	129.5	**129.5**	**129.6**	**128.7**
Metalworking Machinery	**138.0**	**138.0**	**135.3**	
Other Machinery exc. Electrical	**132.1**	**132.2**	**132.3**	
Electrical Machinery	**124.1**	**124.6**	**126.8**	
Fabricated Metal Products	**128.0**	**128.0**	**126.2**	

(*) Estimated (p) preliminary (r) revised

The big push of industrial production amounted to about 227 (1935-39 = 100) in November. Record highs in steel, non-ferrous-metal products, electrical machinery, and transportation equipment combined with high soft-goods production to push last month's level 4% above a year ago.

Steel output may drop after mid-1953, but housing, automobiles, appliances, and machinery production are still continuing strong. Worst current indicator of business is a bad drop in machine-tool orders.

• • •

Auto output, in a breakdown, looks like this: Rate of production for November was close to 8 million (on annual basis). Sales outlook for next year is at least 5 million. Dealer stocks are still high, but '52 models are being cleaned out of some cuts, but with still a fair profit.

Machinery production is rising again. New orders are generally good, and production is heavy. Next year looks like it will be close to '52 in capital spending.

Radio and TV are following Christmas curve, with orders and production rising steadily. New stations to open next year will increase potential market.

Other appliances, though not up to radio and TV, are doing better than expected earlier. Future expansion is in dryers, freezers, and air conditioners, though refrigerators, washers, and vacuum cleaners—still the big sector of the appliance pie—have picked up recently.

• • •

A million auto workers got a cut of 1¢ per hr last month because of the drop in cost of living. The October index rose, but didn't make up the difference. Food prices will probably drop the November index again.

But average weekly wages hit a high in Oct, up 71¢ to $70.80. This was mainly an increase in hours, which went up 12 minutes on the average.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	249.2	250.9	232.2
Steel ingot operations (thousands of tons)	2,191	2,212	2,079
Electric power output (million Kilowatt hours)	7,971	7,884	7,757
Production of automobiles and trucks	129,342	146,825	86,313
Engineering construction awards (*Eng. News-Record*—millions)	$203.0	$269.9	$179.3

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	227	226	218
Index of durable manufactures production (1935-1939 = 100)*	289	287	274
Durable goods manufacturers' sales, millions*	$11,524	$10,412	$ 9,694
Electrical machinery manufacturers' sales, millions*	$ 1,252	$ 1,168	$ 1,026
Other machinery manufacturers' sales, millions*	$ 1,986	$ 1,833	$ 1,658
Durable goods manufacturers' new orders, millions*	$11,998	$ 9,646	$10,266
Electrical machinery manufacturers' new orders, millions*	$ 1,243	$ 1,066	$ 1,129
General machinery manufacturers' new orders, millions*	$ 1,915	$ 1,515	$ 1,783

* Seasonally adjusted

New Flexible Sealing...

T-J AIR CYLINDER

Designed with revolutionary application of

Super-Cushion

It's *sealed with pressure*—a revolutionary T-J application of flexible sealing that insures positive cushion action combined with automatic valving action for fast return stroke . . . eliminates binding and sticking . . . operates with *low friction, minimum wear,* and *added power* due to higher efficiency.

More PLUS features! New type packing nut incorporates a piloted diameter, assuring perfect alignment. Improved rod packing increases sealing efficiency. Piston rod and internal cylinder tube surfaces are hard chrome plated—a standard practice with T-J for over 15 years.

Write for bulletin 252. The Tomkins-Johnson Co., Jackson, Mich.

1. Metallic rod scraper to protect rod bearing and packing from dirt and grit.
2. Wrench flats.
3. Self-adjusting chevron type packing.
4. Permanent type adaptor ring.
5. Hi-tensile tie rods.
6. Heavy duty, hard chrome plated rod.
7. Generous fillet reduces stress concentration.
8. "O" ring static seal.
9. T-J new flexible cushion seal insures positive cushion with automatic valve action for fast return stroke. (Patent applied for)
10. Fine cushion adjustment.
11. Heavy wall precision honed hard chrome plate.
12. Controlled packing compression with metal to metal contact.

36 YEARS' EXPERIENCE (T-J)

TOMKINS-JOHNSON

RIVETORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

One complete piece.....

29 Operations Every 41 Seconds.....

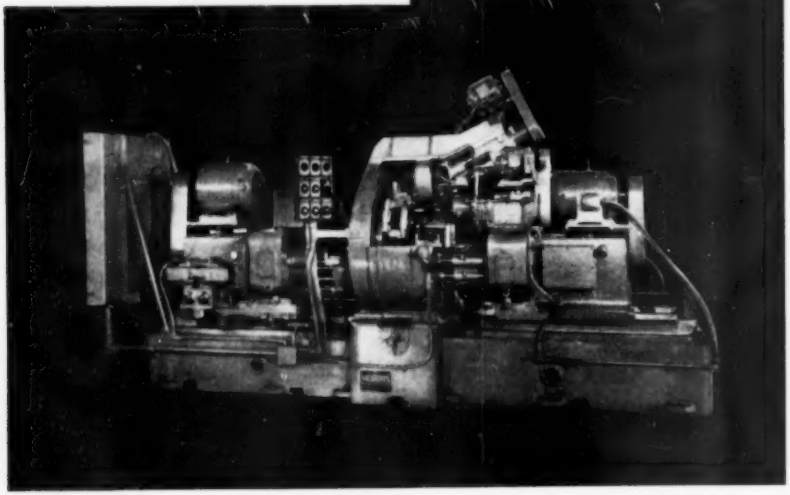
Producing crankshaft main bearing caps, this MORRIS Two Way, 6-Station Machine performs 29 operations with a single loading. One head carries 14 spindles, the other 12 spindles. Production rating is 87 pieces per hour at 100% efficiency. Operations performed include drilling, reaming, spot-facing and tapping.

This Morris application, for a leading automotive manufacturer, illustrates that "two heads are better than one" for higher production at lower cost. Put your heads together with MORRIS Engineers on any mass production, multiple drilling, reaming, tapping and similar operations. You'll save time, money, labor and floor space.

on this

Morris

MOR-SPEED MACHINE



"A Better Product at Less Cost . . . with PRECISION PLUS PRODUCTION"

Morris

THE MORRIS MACHINE TOOL COMPANY
933 HARRIET ST. CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Extending the Worker's Ability to Produce

At first glance, motion study might seem remote from the immediate problem of operating a machine tool with topmost efficiency.

But in a recent speech Harold T. Johnson, manager of the production engineering division of Vauxhall Motors Ltd., British subsidiary of General Motors, gave motion study its true importance.

He pointed out the main reason why Vauxhall is purchasing new machine tools. It is to "reduce costs by extending our operators' ability to produce."

Then he stated the logic of using machines which conserve human energy. Keep in mind that any movement of the human body causes fatigue, consumes time and thereby affects costs.

Whereupon Mr. Johnson praised the work now being done by our American machine tool builders in applying motion study to the design of their products.

HE OUTLINED three general principles which reduce the machine operator's personal efforts to a minimum:

(1) Locate machine controls so that the operator can maintain normal posture and does not have to work within a dangerous area.

(2) Design controls to eliminate unnecessary motions from the operation cycle.

(3) Put controls so that necessary motions are within a normal work area.

These principles seem simple enough. You might easily conclude that every machine tool incorporates them. But that isn't true, especially among some of the foreign machines.

One European user complains that he has trouble getting European-built machines which are designed at the proper working height for the greatest efficiency of the operator. The work area often is not at elbow level — by far the most desirable spot. It is either too high or too low, mostly too high. And that fact tires the operator quickly and results in lower production (though there may be no major criticism of the machine itself otherwise).

THIS MATTER of motion study, then, is of more than academic interest. If one of the main purposes of installing new production equipment is to extend the operator's ability to produce, the operator will turn out work in direct proportion to the ease with which he can do it. The easier it is, the more work he will produce.

Motion study, the merits of which have long been recognized, deserves the close attention of production-equipment builders and users. Properly applied it can be a major factor in justifying the replacement of old machines with new.

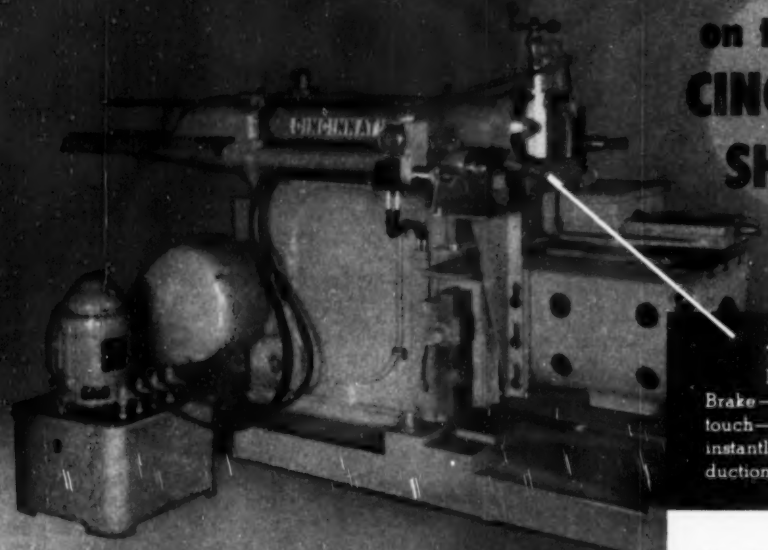
But its value goes much farther than even Mr. Johnson indicated. It gets into the problem of feeding work into and out of machines; in carrying work from one operation to another; in heat-treating and finishing; in assembling and inspecting the product.

In all of these production phases scientific motion study is important because it does essentially the same thing for all production workers that it does for machine operators — extends their ability to produce.

Burnham Finney

Do STANDARD SHAPING *and* AUTOMATIC DUPLICATING

on the *same* CINCINNATI SHAPER



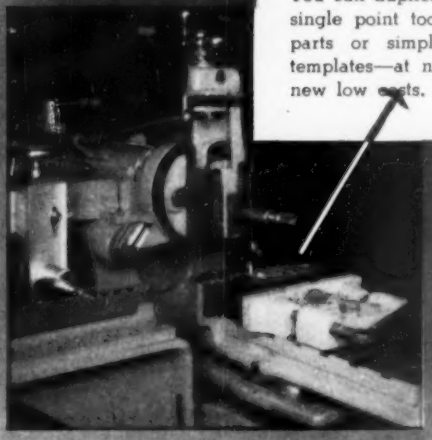
The powerful Cincinnati Magnetic Clutch and Brake—controlled with a finger touch—starts and stops the ram instantly, and speeds production.

YOU can change from Standard Shaping to Automatic Duplicating without a hitch on this hydraulic follower-equipped Cincinnati Shaper. The duplicating mechanism does not interfere with standard shaping operations.

The new Electro-Magnetic Clutch and Brake also brings greater ease of control and greater speed in operation.

A Cincinnati Shaper is the handy man of industry and will be versatile and profitable in your shop.

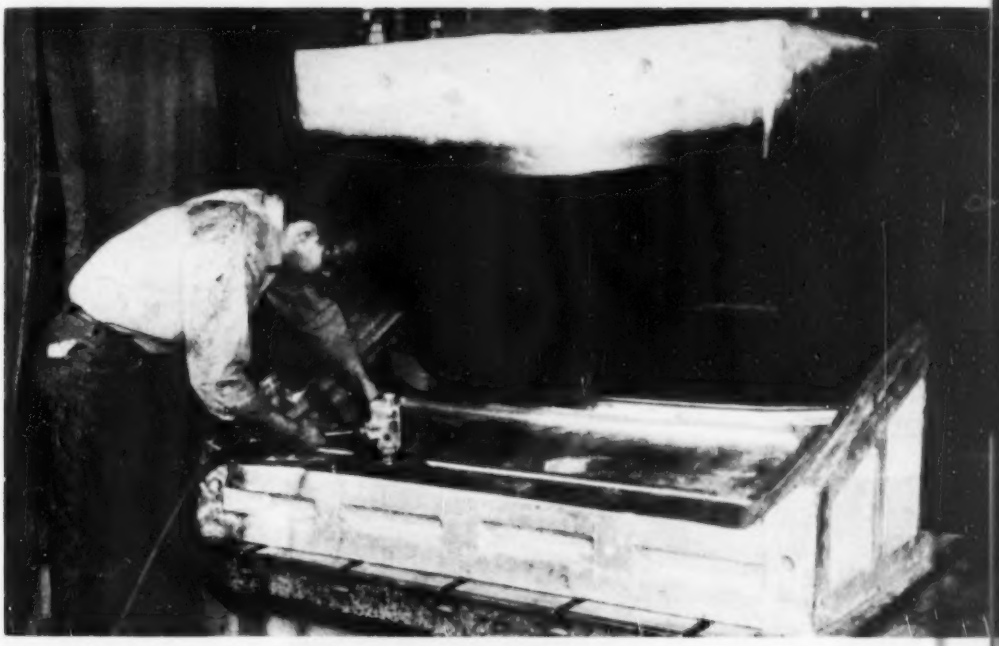
Write for Automatic Contour Duplicating Bulletin DN-1 and Catalog N-5.



You can duplicate parts with a single point tool, using actual parts or simple sheet metal templates—at new speeds and new low costs.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES



ZINC ALLOY DIES are easily "spotted" to remove high spots and to smooth and blend radii and curves. This particular die was built to produce experimental truck cab panels

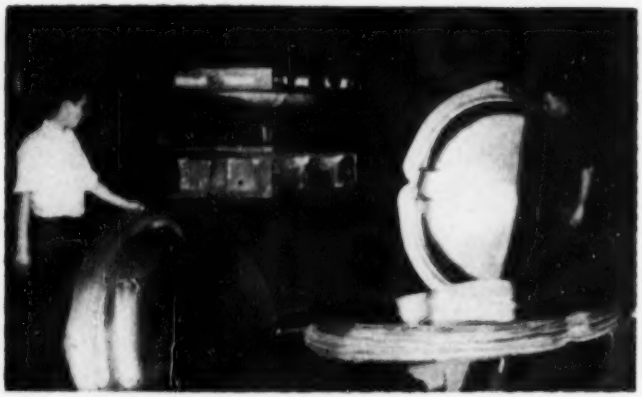
Low-cost methods speed die construction

Zinc alloys with expanding plaster patterns, and a non-shrinking casting resin are cutting costs and speeding accurate production of large experimental dies for stamping automotive, aircraft, and other parts. Sometimes these materials are combined, and where long-run production is involved, steel sections may be added. Here's a description of how these tools are made and applied

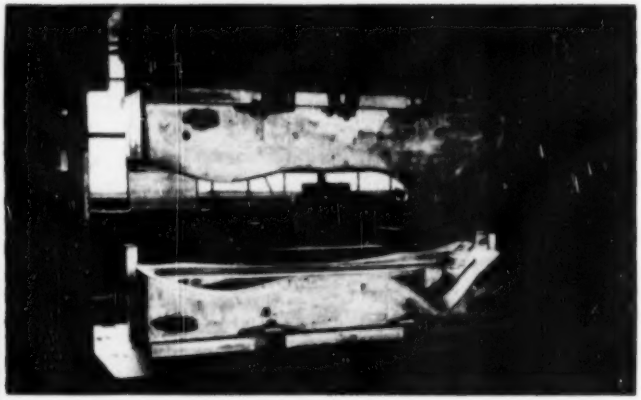
BY W CURTIS MILLER, PLANT MGR. RICHARD BROS. DIV., PLANT 4, ALLIED PRODUCTS CORP, HILLSDALE, MICHIGAN

LARGE SAVINGS are gained in tooling up for experimental parts in the aircraft and automotive industries by using low-cost methods of producing stamping dies. Zinc alloy dies, for example, are made cheaply and accurately and they produce exactly the same characteristics in the work as are obtained with steel dies—unlike parts made on wooden forms. Die designs are proven, too, before permanent tooling is started, and in addition, dies can be built quickly to save downtime while a broken die is repaired or rebuilt. When the form of the part and the metal to be stamped have suitable characteristics, zinc alloy dies can produce runs of several thousands of pieces.

These and other advantages are gained by the judicious application of low-cost methods. Richard Bros Div, of Allied Products Corp produces plastic dies as well as zinc alloy and permanent steel dies on a contract basis, the type of die built depending upon the circumstances under which it is to be used. In some cases zinc alloy, ("Allite")



THREE PIECE zinc-alloy drawing die produces large aluminum stampings for Link trainers. Good surface finish, absence of wrinkles are characteristic of work produced with these tools



STEEL AUTOMOBILE FENDERS are made with this zinc-alloy die in a 500-ton press. This die material permits easy flowing of metal in forming so that complex curves are made with a minimum of difficulty

dies with steel inserts are used for relatively long runs or for especially difficult stamping conditions; in other cases, steel is combined with the non-shrinking plastic material. Each application is reviewed in the light of its own particular requirements before a recommendation is made or a die built.

Wide range of applications for plastic dies

The recently publicized plastic material used here is a thermosetting liquid phenolic resin which is dimensionally stable. The plastic was developed by Rezolin, Inc of Los Angeles, California and is employed by Allied Products as the result of a special arrangement. With it, exact size patterns can be used in making dies instead of oversize patterns heretofore employed to allow for shrinkage. The plastic is mixed cold, poured without pressure, and is cured at 160 F for 12 to 24 hours.

Among other tools, it is used to make stretch dies, form dies, draw dies, Keller patterns; master models, spinning chucks and jig bases. Tools are cast from standard scale models and there is no machining or handworking of surfaces. High surface finishes are obtained by waxing and polishing shellacked plastic molds. Besides being considerably cheaper than conventional tools, a typical die made of this material can be produced in much less time than a similar conventional die. In one case, a complex plastic die was made in less than three weeks as compared with 14 to 16 weeks for a comparable steel die.

At this time, a greater backlog of experience is required to determine the exact life of a given plastic die as measured by the number of pieces that can be produced, however, aircraft manufacturers have reported almost unlimited life when forming aluminum and stainless steel parts.

How plastic dies are made

Typical casting procedure begins with construction of a plaster pattern or a wood model. Casting plaster is usually the best and cheapest material and since mold shrinkage is not a factor in any case, close tolerances can be maintained without the necessity of oversize patterns. A plaster splash, or mold, is then prepared in accordance with conventional practice, wall thickness being between one and two inches and supported where necessary by a metal or wood frame. An accelerator paste, for hardening without heat, is mixed with the resin, (usually in the ratio of 100 parts of resin to 25 parts of paste) and the mixture poured evenly into the molds. After the mix is poured it is allowed to air-set until it is firm before curing in an oven.

The curing cycle depends to a large extent on the cross-section of the casting and on the heat transfer characteristics of the mold. Usually castings of 100 pounds or less, total plastic weight, require 12 to 16 hours curing time. Castings over 100 pounds require 16 to 24 hours—greatest dimensional control being obtained with a 24 hour cure. Final step is to remove the casting from the mold and clean it up generally. Flash and other irregularities are removed with hand files or grinding disks. High polishes are obtained by sanding with wet sandpaper and water to first remove all surface irregularities then the casting is buffed and polished. Machining, when neces-

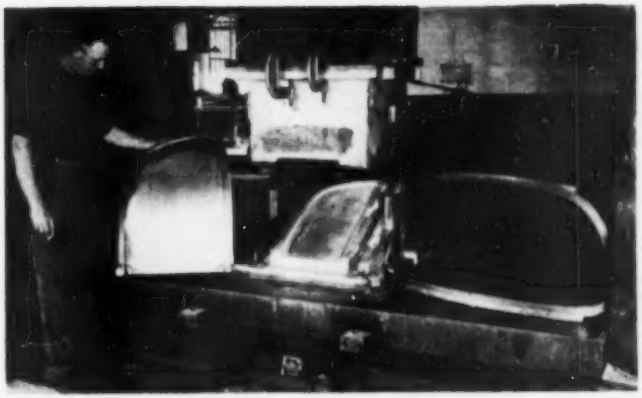
sary, is accomplished with conventional shop equipment using high speeds and light cuts.

Zinc alloy stamping dies for experimental and short-run production

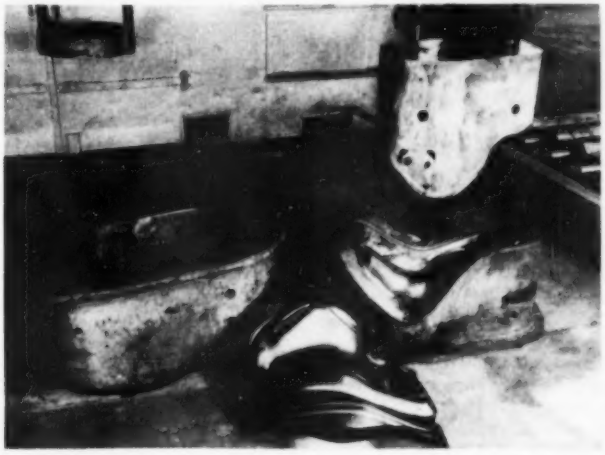
"Allite" dies, made of any desired formula of zinc alloy, are made in any size up to a 15-ton casting or more, if required. Besides building the dies for use in customers' plants, Allied Products employ them in try-out presses for making short-run production and experimental parts. Stampings for eight prototype truck cabs for example, would obviously be economically impractical to make with hardened steel dies, yet without dies, the parts would have to be hammer formed, resulting in greatly different physical properties. A number of parts for these cabs were quickly made with zinc alloy dies which gave exactly the same characteristics as those later obtained with permanent tools.

Quantities of experimental and low production parts run from 8 to 8000 pieces with material thicknesses going up to 3/16 in.—all satisfactorily produced in zinc-alloy dies. Typical parts formed, drawn, pierced, and blanked with these tools include steel flywheel housing covers; steel truck fenders, floor pans, headlight assemblies, instrument panels, and cab roofs; stainless steel hot air ducts for aircraft; aluminum parts for Link trainers and others.

The cost of a large, complex drawing die is usually high enough to make it practical to first make a zinc alloy die for checking the design. In this way it can be determined just how the material will draw. When satsifactory parts are produced, the "Allite" die may be used as a model on a Keller machine for contour machining the steel die. Later, the zinc-alloy tool is melted and the material used again, so that there is no waste of material or loss of time in proving hard die development. For some unusually difficult drawing operations, pre-testing a permanent draw die can reduce tooling costs by as much as 50 percent. Fitting, and subsequent finishing, or alterations resulting from engineering changes, can be made quickly in zinc alloy because this material is

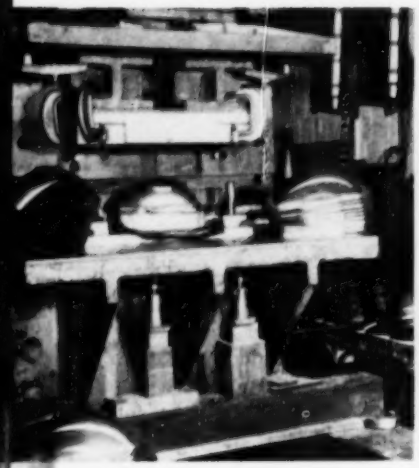


AUTOMOBILE WINDOW MOULDINGS are made in a zinc-alloy die which was cast and made ready for service in a little over one week. Two parts are later blanked out and welded together to form finished part, right



INTRICATE DRAW required by the unusual contour of the experimental section of an automobile fender is made with zinc alloy die, thus providing a simple and economical method of developing proper design in final tools

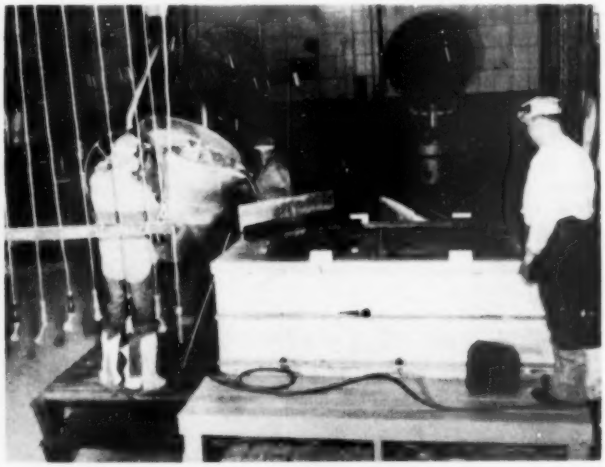
STEEL FLYWHEEL housing covers for automobile transmissions are drawn and embossed in this zinc-alloy die. Material is 0.035 in. thick, die lubricant is a water-soluble compound, percent area reduction is 27% with a 6-in. depth of draw



TRIM DIE for 20-gage steel housing covers is zinc alloy with steel inserts for notches

IN MAKING a zinc alloy die, a stable plaster pattern, made from an expanding plaster mold is used. This is oversize to compensate for predictable shrinkage of zinc alloy. After coating with aluminum paint to provide a slick surface that will draw out of sand easily, pattern is placed on bottom board preparatory to covering with sand

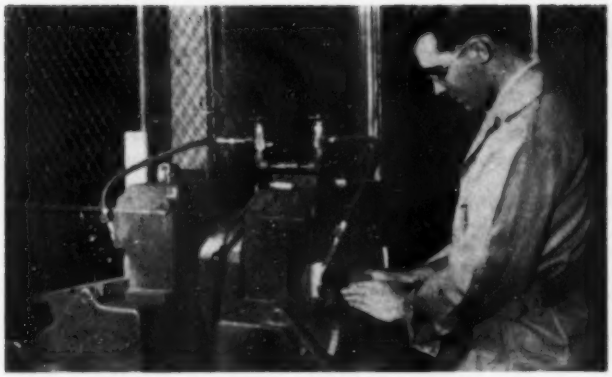
FLASK is filled with sand, rammed tight for uniform density. After adding a top board, assembly is turned over to place bottom board on top after which it is lifted off and the pattern removed



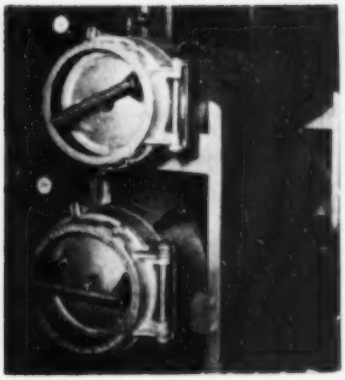
ZINC ALLOY is poured in open mold. Material shrinks at a predictable rate as it solidifies but because pattern was made oversize in exactly the same degree that shrinkage occurs, the cast die is formed to close tolerance, exact dimensions. Often, two or more dies are cast simultaneously to speed tool production

easily machined or built up when reworking is necessary. Experimental dies can be made quickly for an entire piece or for critical draw areas alone.

Wooden models, carefully made to blueprint size are employed as patterns with medium-high expansion plaster as the first step in making a zinc-alloy die. This produces a mold expanded at a known rate into which a stable, hard plaster is poured to produce an oversize pattern from which the zinc alloy die is later poured in sand. Total dimensional shrinkage of the die metal conforms to the expansion of the expansion plaster. This off-setting of the die metal shrinkage by the use of oversize patterns provides tools made to close tolerances. Finishing of die contours is completely accomplished in the "barber" shop and generally, the only additional metal removing required is the planing of mounting surfaces.



JET OF CO_2 is directed to strike at point of contact of wheel and tool. Ball and socket joint permits nozzle adjustment



TWO CO_2 CONVERTERS are coupled to common header so second tank can be utilized when first one is empty

CO_2 COOLS CARBIDE GRINDERS

Offhand grinding of carbide tools, with CO_2 coolant, shows better finish, less wheel wear, and shorter time

BY A B ALBRECHT, Metallurgical Engineer, Monarch Machine Tool Co

Considerable gain in grinding time and improvement in the ground surface may be obtained by using CO_2 as a coolant in grinding carbide tools. The CO_2 seems to produce two effects on the operation: It tends to clean the wheel of dull grit, and it extracts heat from the tool surface.

The first of these factors is highly important, for a dull wheel produces a poorly ground tool—one which is overheated and has residual stresses in the ground surface. Such tools fail early in service through chipping, prior to normal wear.

If a grinding wheel is kept clean and not allowed to load up with dull grit, a much improved cutting condition will be obtained. Less heat will be put into the grinding operation and the chance of residual stresses is reduced. Also, a greater amount of metal may be removed per unit time, with less wheel wear.

Tool	Condition	Time Min	Metal removed cu in.	Δt of Calorimeter	Average temp °F	T-jet orifice in.
A1-12	Dry	0.5	0.0026			
A1-12	CO_2	0.5	0.0044			0.021
C-10	Dry	0.75		1.2	157	
C-10	CO_2	0.75		–0.3	64	0.021
FL-20	Dry	1.0		3.2	117	
FL-20	CO_2	1.0		0.4	81	0.021
FL-20	CO_2	1.0		0.3	89	0.012
FL-20	CO_2	1.0		0.9	91	0.033

RESULTS OF TESTS show noteworthy temperature drop when tools are ground with CO_2 coolant. All grinding was done with 60-J-14 wheel

Our installation includes two 600-lb dry ice converters which stand outside the toolcrib. Supply lines draw liquid CO_2 from the back end of one converter to a central line which serves the machines. Control valves inside the toolcrib make it possible to change over from one converter to another when the first supply is exhausted. One tank will last about 3 days, running 5 hr per shift.

T-jets having an orifice of 0.023 in. control the flow of CO_2 to the grinding wheel. The jet is on a ball socket so it may be adjusted to the size of the tool being ground.

To obtain some quantitative measure as to the advantage of CO_2 over dry grinding, a series of tests was made, as shown in the accompanying illustration.

Several tools were ground, using abnormal pressure, then placed in a calorimeter to determine their average temperature. They were also checked for loss of weight to determine the amount of metal removed.

Although CO_2 is an expensive coolant, our results at Monarch indicate the cost can be justified by the improvement in the quality of the finish ground tool, the saving in wheel wear, and the shorter grinding time required per tool.

THE RISING GERMAN CHALLENGE...

Burnham Finney visited the Hanover and Olympia (London) machine tool shows this Fall, then made a first-hand study of the German machine tool industry. He talked with German builders from Hanover, Dortmund, and Dusseldorf in the North, to Stuttgart in the South, and inspected their plants. Here are his observations on the German industry: they form part of his address before the National Machine Tool Builders' Ass'n at White Sulphur Springs, W. Va, on Nov 14, 1952

BY BURNHAM FINNEY, EDITOR

MACHINE tool production in western Germany, including West Berlin, is equal today in physical volume to that in all of Germany prior to the war.

The size and strength of the West German industry was demonstrated at the recent Second European Machine Tool Exhibition at Hanover, Germany. The Germans dominated this show, with more than 500 exhibitors out of a total of 800.

Never before had so large a machine tool show been staged anywhere. It was one-third bigger in floor space than the American show in 1947 at the Dodge-Chicago plant in Chicago. It surpassed the First European Exhibition at Paris in 1951.

Even if one recognizes the contribution of other nations to the success of the show, Hanover was a symbol of the dramatic return to the limelight and to world markets of the German machine tool industry. The show's enormous size was partially assured by the financing of a new exhibit hall by the machine tool builders of Germany who are reported to have advanced some 1 million DM as payment for 1952 rentals of space at Hanover for this year's show. This added an eighth building to the impressive array of halls already available.

The spectacular comeback of the German machine tool industry can be traced to three factors:

(1) Rebuilding and expansion of builders' plants which had been bombed during World War II or and dismantled after the war.

(2) Getting back into full production of companies neither bombed nor dismantled but prevented from producing machine tools for a time after the war.

(3) The starting up in the western zone of machine tool plants by builders who had escaped from the Soviet zone.

Bombed Factories Rebuilt

There are numerous cases to illustrate how bombed or dismantled factories got going again. A builder of planers and hydraulic presses (Wagner) was badly bombed and put out of production in 1945. A year later the British completely dismantled the plant and sent most of the machinery to Pakistan and India.

Half a dozen of the company's engineers accepted offers to go to Pakistan, where they helped to set up a factory to build engine lathes. Only one of the engineers has returned thus far. Just after the plant had been stripped of everything, the management received word from the British that it was forbidden indefinitely to build machine tools.

At that point the company helped its men get temporary jobs until permission could be obtained to resume machine tool building. It wasn't until three years later—in June 1950—that the British relented and gave their consent to resumption. As one of the management group said, "Our three years out of business did far more harm than all the bombs and dismantling."

The company began business again by securing some used machine tools wherever it could. Neither bankers nor other manufacturers were very helpful. No government money was involved. It became a matter of ingenuity and persistence. Activities gradually enlarged, and today the company employs 600 workers on three 8-hr shifts six days a week. The management hopes to have 1000 men at work in a year or two—the same number it employed before the war. There is little worry about getting orders; the chief problem is to secure enough more machine tools to turn out the required volume of work.

Dismantled Plants

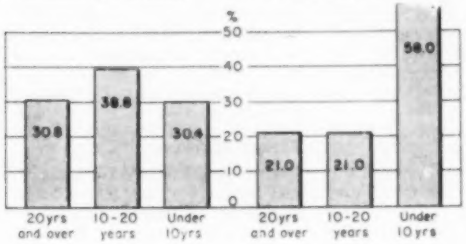
Then there is the case of Schiess at Dusseldorf. Schiess makes heavy machine tools. It was dismantled systematically and completely. All valuable machines were shipped to Russia or her satellites. All buildings containing any steel were torn down to salvage the steel. Rails were ripped up and electrical conduit pulled from the walls. Only heaps of rubble were left.

Within two years, a new modern plant, now employing 1900 workers, had risen from the rubble. To retain its staff of designers, specialists, and skilled workers the company turned to manufacture of mining machinery, coal conveying and elevating equipment, textile machinery, and jigs, fixtures and dies. When the ban on building machine tools was lifted by British authorities, Schiess was a going concern. Today, Schiess is making vertical turret lathes and vertical boring mills with turning diameters of 315 in. and more; horizontal boring and milling machines; gear hobbing machines; crankshaft journal turning machines; and special equipment.

Gebr. Heller is an outstanding example of a German builder who was fortunate enough to escape being bombed or dismantled. The company's factory at Nurtingen, near Stuttgart, is one of the world's finest machine tool building plants, employing 1100 workers and manufacturing a wide range of machine tools. Herman Heller, head of the company, was the commissioner general

in the World's Machine Tool Markets

AGE CLASSIFICATION OF MACHINE TOOL INVENTORY



RATIO EMPLOYEES TO PLANT EQUIPMENT

Size of Co by No. existing machine tools	No. of Co's	No. of employees	NO. MACHINES Machine tools	Other machines	Total	RATIO Employees to machine tools	Employees to total machines
49 and under	17	1108	429	440	869	2.6	1.3
50 to 99	37	7700	2756	1410	4166	2.8	1.9
100 to 199	54	19,478	7615	3294	10,909	2.6	1.8
200 to 499	60	43,190	18,901	7061	25,962	2.3	1.7
500 to 999	27	36,256	18,595	7186	25,781	2.0	1.4
1000 and over	13	44,143	23,722	9369	33,091	1.9	1.3
Total	208	151,875	72,018	28,760	100,778	2.1	1.5

of the Hanover Show and is one of Germany's representatives on the European Committee responsible for the annual machine tool exhibitions in western Europe.

Gebr. Boehringer G.m.b.H. at Goppingen, near Stuttgart, is another example of a company which went through the war unscathed and through the postwar period without being dismantled. It began operations again after the war by making textile machinery and still devotes a sizable ratio of its work force and plant capacity to this end of its business. However, it is back in the lathe-manufacturing business and has some 1000 men at work building lathes. Altogether, it employs today about 2000 people.

Escapees Reorganize

Most dramatic of the factors contributing to Germany's meteoric rise in machine tool production the past few years has been the relocation in western Germany of builders whose plants were in the eastern zone and who have escaped across the Soviet border to reestablish themselves. Hermann Pfauter at Ludwigsburg is working day and night in a new plant which now houses about 400 workers. The company's original plant at Chemnitz in the Soviet zone was dismantled by the Russians and shipped somewhere east of Moscow.

When Dr. Pfauter managed to get out of the Soviet territory and into the west, Adam Opel automobile works at Russelsheim, near Frankfurt, gave him space and machines to start up. Later he moved into an armory in Kornwestheim and now is in the factory at Ludwigsburg which was partly financed by funds from the Economic Cooperation Administration in Washington. The ECA emblem, in fact, is on the front of the factory. The company is making gear hobbing machines and is exporting about half its current output. It wishes to increase that ratio of export to domestic business.

J E Reinecker Maschinenbau G.m.b.H. at Einsingen, near Ulm, is employing around 400 men in the manufacture of relieving lathes, grinders, tool grinders, milling machines, and other machine tools. Reinecker was one of Germany's largest machine tool builders at Chemnitz before and during the war. It had 4000 on its payroll. The plant first was bombed and later dismantled by the Russians and carted away somewhere into Soviet territory. Dr. Reinecker was taken prisoner by the Russians and removed to Russia, from which he finally escaped. A few of his engineers and foremen found their way individually into western Germany and rejoined Dr. Reinecker.

The operation at Einsingen is in a factory formerly occupied by Eastman Kodak Co. This factory turned out war goods for the German army and was bombed out late in the war. The financing of Dr. Reinecker's operations has been done by the Government of Wurttemburg, which is reported to have used ECA counterpart funds. More than 37% of Reinecker's employees are refugees from eastern Germany. Some 60% or better of today's shipments from this factory are going to export customers, much of them to Britain.

American Funds Help

The amazing comeback of the German machine tool industry has been financed in a variety of ways. American government funds have provided at least part of the necessary capital in a number of cases. If the money did not come directly from ECA it was allotted from counterpart funds. That was true not only of Pfauter and Reinecker, but also of others. Fritz Werner, and Linder, both in West Berlin, received help from US funds.

The German government is reported to have given financial aid in some cases. The criterion has been: How essential is this company to the national economy? If the answer was affirmative, the builder got the aid which he sought. Banks and insurance companies also loaned money to German machine tool builders. But interest rates in Germany are very high. One German builder sold valuable parcels of property in the downtown area of the city in which it is located, thereby helping to raise funds to get started again. Another builder is said to have got going by means of a substantial order from the Polish government for a big machine, the Poles having advanced part of the purchase price. In still another case, a German builder received payment for engineering services in helping a British builder begin manufacturing its products in England. On top of that, companies like Schiess and Boehringer, already mentioned, went into manufacture of products other than machine tools.

Labor Rates Low

Labor conditions in Germany are very favorable for machine tool builders. The supply is fairly abundant. And many builders not very far from the East German border employ a considerable number of refugees. The hourly rate for

skilled workers ranges from 1.70 DM in the smaller cities and towns to 2 DM (47 cents) in the larger cities. The most highly skilled workers receive 2.30 DM. But they are the exception rather than the rule.

German machine tool builders have one distinct advantage over their competitors in other European nations. They pay much smaller payroll taxes for social security benefits. The tax runs to 60% in Italy, 50% in France, 50% in Belgium and only 22% in Germany.

The regularly accepted work-week in western Germany, as it is in all European countries, is 48 hr. No overtime is paid until that level is reached. And then the premium is only 25%, which is in sharp contrast to the time-and-a-half and double-time charged in this country. Most German machine tool builders have been operating 50-55 hr a week, and 60 hr in a few cases.

There has been little labor trouble in the German machine tool industry. Few strikes have developed recently. About a year ago a general strike occurred in the metalworking factories in one area. The men were out for 5 or 6 weeks and finally settled for a wage increase of 3 pfennigs (100 pfennigs equal 1 DM, and 1 DM is equal to 23.5 cents or a bit less).

Business Booms

Most German machine tool builders have overflowing order books. They do not seem worried about future business. They expect to keep their plants busy. More of a worry is the matter of installing more machine tools in their factories to enable them to increase the number of machine tools they are able to manufacture. Where is all of this business coming from?

There is a tremendous market for new machine tools within Germany itself. Bombing destroyed more machine tools than Americans had thought. Many German builders have before-and-after photographs of their bombed plants. As the British and the French moved in, they took for reparations the best and most modern machine tools.

Daimler-Benz at Stuttgart is a good example of what happened. It had some 7500 machine tools in its automobile factory. First the plant was bombed, then the French came in and carted off 1700 machine tools. Altogether, Daimler-Benz salvaged around 3000 machine tools from the rubble.

The French did a thorough job of picking out the better machines, despite the fact that they removed machines quickly. For one thing, they took practically all the U S machine tools (such as Gleasons, Sundstrands, LeBlonds, Barber-Colmans, Gould & Eberhardts, Fellows, Pratt & Whitneys, Bryants, Gisholts). Later on, Daimler-Benz took on the job of making trucks for the U S army; but it had to get back about 800 of its machines from the French to get going. U S authorities intervened and Daimler-Benz thus recovered a portion of the machines which the French had removed. All the American machines were included in the list recovered.

Daimler-Benz has purchased 1800 machine tools for its Stuttgart automobile plant since the war. All are German-built, with the exception of 60 U S and 35 Swiss machines.

Middle-Aged Equipment

Almost seven out of every ten machine tools installed in German factories is more than 10 years old. That fact was revealed in a survey recently made by VDMA (German Machinery Builders Association). The survey shows that German metalworking plants have a large percentage of over-age equipment. To be specific: 30.8% of the machine tools installed are 20 years old or older; and 38.8% are from 10 to 20 years of age. Only 30.4% are under 10 years old. The survey questionnaire was answered by 208 companies employing 151,000 workers and possessing some 72,000 machine tools.

The high average age of German machine tools is a reflection of the difficulty of securing machine tools in Germany between 1942 and 1948. The Germans make this point: If our industries at home do not modernize, they will be in a poor competitive position to contend costwise, and will be severely handicapped in selling their products in world markets (American metalworking companies please note).

Export Markets

Some 60% of Germany's machine tool business today is for export. Production of machine tools in western Germany amounted to DM 436 million in the first half of this year. Of that total, DM 258.5 million was shipped to foreign customers. Great Britain took DM 60 million and the United States DM 29 million in that period.

Switzerland was third among the countries buying German machine tools, with DM 20 million. Sweden, absorbing DM 17.9 million, was fourth; and Brazil, with DM 17.5 million, was fifth. France bought DM 16.7 million of German machine tools, and Italy DM 15.7 million. Western Europe, excluding Germany herself and the British Isles, accounted for DM 92 million of Germany's shipments in the first half of 1952.

One German builder, Fritz Werner in West Berlin, has received orders for more than 1600 machine tools from the British for their defense program.

Spain is regarded as a coming market for German machine tools. At least one German builder bluntly declares that much of the pending Spanish business is contingent upon a loan from the United States to Spain. American taxpayers' money, in short, will be used directly or indirectly to finance the purchase of German machine tools by Spanish metalworking companies.

South America is not being overlooked in the hunt for machine tool

EQUIPMENT DISTRIBUTION

Co size by No. employees	No. of Co's	Total employees	TOTAL NO. OF MACHINES: Machine tools	Other machines	Total
under 50	9	314	361	46	407
50 to 99	17	1207	1393	439	1832
100 to 199	30	4618	3083	1379	4462
200 to 499	64	20,072	11,912	4032	15,944
500 to 999	42	28,818	14,347	7167	21,514
1000 and over	46	96,783	40,922	15,697	56,619
Total	208	151,875	72,018	28,760	100,778

AVERAGE AGE OF EQUIPMENT

Age	MACHINE TOOLS: % total	% distribution for each Co	OTHER MACHINES: % total	% distribution for each Co
20 years and over	30.8	30.9	23.2	23.5
10 to 20 years	38.8	39.1	37.3	36.9
under 10 years	30.4	30.0	39.5	39.6

orders. Note that Brazil is high on the German list of export customers. And some German machines are priced low enough to make a strong appeal in Latin America.

Drang Nach Oesten

Despite the lucrative market in the west, the Germans are conscious of the lush prospects elsewhere. Prewar, a hefty slice of Germany's foreign markets was to the east and southeast. The Germans are not reconciled to abandoning these markets. Vice-Chancellor Franz Bluecher of the West German Republic, at the opening of the Hanover Show said that a great problem for Europe is the opening up of undeveloped territories: North Africa, the Near East, the Middle East. "Our task as Europeans," he stressed, "is to utilize the riches of these areas for the food and raw materials needs of an overpopulated Europe and, in turn, raise these areas to the level of culture and civilization which every human being can rightfully demand."

German machine tool builders intend to seek, and already are soliciting, orders in India and Pakistan, in Turkey (where the affinity for German goods is said to be reasserting itself), and in Southeast Asia. Some builders apparently have been offered attractive orders by Red China. A Red Chinese buying mission is reported to have been floating around East Berlin, eager to place orders west of the Iron Curtain. A few German builders would like to accept Chinese business, on the theory that if the West helps China to industrialize, there is a chance that China might be split off from her friendship with Russia. But the allied authorities will not approve such action.

American Market

The Germans look longingly at the U S market as a source of business; they have capitalized handsomely the past year on the inability of domestic builders to make short-term deliveries and to sell to customers with non-rated orders. But the wiser Germans are taking a realistic view of America as a long-time market. They know that the rush of business from this country, encouraged by the Air Force when delivery was the paramount factor, cannot continue.

German builders, on the other hand, do not intend to abandon the American market. They expect to make a fight for it. They recognize, however, that if they expect to sell much here, either of two considerations is essential: (1) their product must be priced substantially below the comparable American products; or (2) their product must be something special which meets a need that no other machine tool meets as well. And adequate provision must be made for manufacturing the machine and accessories, such as the electrical equipment, to US standards and for proper servicing. Altogether, many builders are of the opinion that they will get farther by concentrating their efforts on markets in other parts of the world than America.

New Designs Shown

The Germans have done a lot of copying of American machine tools, but they also have come up with some original and ingenious designs. In starting from scratch again, they have had the incentive to do much new engineering. One German builder took advantage of 14 months of confinement as an allied military prisoner to redesign completely his entire line of machine tools. Now he is making this new line, and his order board is full for a year or more ahead.

One thing is sure—the Germans have gone in for "production" machine tools, which compete directly with US machines, more than ever before. They are now manufacturing high-production, special purpose machine tools for the automobile industry. They include semi-transfer and complete transfer-type machines. Such builders as Gebr. Heller Maschinenfabrik G.m.b.H. at Nurtingen, Karl Huller G.m.b.H. at Ludwigsburg, L Burkhardt & Weber K G at Reutlingen, and Ludwigsburger Maschinenbau at Ludwigsburg are engaged in the production of these special machines primarily for the automobile industry.

The development of German-built special-purpose machines has been encouraged by German automobile makers who have done much, if not most, of the tool engineering and design work, then turned it over to the machine tool builders. The German builders learn fast as this know-how is passed along to them.

Important European buyers who attended the Hanover Show are of the unanimous opinion that the Germans have made great strides in the designs of their new machine tools. But they also agree that these machines, on the whole, are not yet up to American machines, which still are the world's best from the standpoint of performance, lowest cost per piece produced, and quality of materials and workmanship.

Expansion Continues

The German machine tool industry still is expanding its production. Many builders are far more concerned with being able to secure new machine tools for their own plants in order to enlarge their output, than they are with the problem of getting orders which will keep their plants busy. They are confident that orders will not be hard to secure for some time ahead.

Leaders in the industry, nevertheless, are not fooling themselves. They realize that the millennium has not come. They will be over the peak some day. They have cashed in on Britain's defense tooling program, which resulted in orders for 4200 German machine tools, and on the US machine tool industry's preoccupation with defense requirements at the expense of foreign markets. And keep in mind that there was a large number of prototype machines shown at Hanover.

When the order curve inevitably points downward and machine tool selling becomes much more highly competitive than it has been since Korea, Germany's imposing list of 500 machine tool builders is bound to shrink drastically. A year or two after the downturn sets in, it is not likely to be more than 250. So-called machine tool builders have sprung up almost from nowhere recently. Many of them will disappear as suddenly as they appeared.

Even so, the fact remains that the German machine tool industry is back to prewar strength and size, and is a force to be reckoned with in world markets from now on. To one who has had a chance to study this industry at first hand, it comes as no surprise that every other machine tool industry—British, French, Belgian, Swiss, Italian, American—looks upon the Germans as its No. 1 competitor from here on.

EQUIPMENT RATIOS

Size of Co by No. existing machines	Ratio: Machine tools to other tools
49 and under	0.98
50 to 99	1.8
100 to 199	2.3
200 to 499	2.7
500 to 999	2.6
1000 and over	2.5

NOW...

diamond bort is saved ...

carbide tools last longer ...

grinding time is reduced ...

equipment costs are cut ...

NEW METHOD OF GRINDING CARBIDE CUTTING TOOLS requires only simple belt grinder and silicon carbide abrasive belt. Here, cutting tool angles are easily set up by raising, (or lowering) table to bring top surface of tool into alignment with gage

WHEN ABRASIVE BELTS GRIND

In an effort to save diamond bort, and to speed the grinding of carbide cutting tools, a new abrasive belt machine has been developed. Test results indicate it will answer the need of shop owners now handicapped by the current shortage of bort, moreover, tool life at least equals and usually exceeds life obtained by grinding with diamond wheels, honing to remove burrs is eliminated and grinding time is reduced.

Development work was carried out by Behr-Manning Corp, Troy, N.Y. and Fenlind Engineering Co., Rockford, Ill. Exhaustive tests were made with tools ground by the new belt method on hard-to-machine material and in difficult setups. Results were compared with those obtained with conventionally ground carbide tools used in exactly the same setups.

Equipment is simple, easy to handle

The machine is a comparatively simple belt grinder employing a somewhat different principle from that found in ordinary machines of that type. It operates dry and the work can be ground either free-hand or with fixtures. Conventional cloth and paper backed silicon carbide belts are mounted over a 5¼-in. dia CI drive pulley with a 0.007-in. crown face and a 16-in. dia CI driven pulley. Both pulley faces are 4¼-in. wide and belt width is 4-in. A ¼ hp drive motor is mounted so that its weight maintains constant tension on the belt; a simple cam-locking shaft provides for tightening or loosening it. Belt tracking is controlled by a handwheel operated pivot under a platform on which the motor and drive pulley are mounted.

A horizontal work table is vertically adjustable to permit development of the desired angle between the tool and the face of the pulley. With the top surface of the cutting tool aligned with the horizontal centerline of the driven pulley—a zero angle is indicated by a calibrated setup rod. Graduations are accurately marked and raising or lowering the table to align the top surface of the tool with any of these graduations provides the desired clearance or rake angles. Raising the table above the center of the pulley gives a positive angle between the tool and the pulley—lowering it below center provides a negative angle.

The 16-in. driven pulley has a flat face in intimate contact across the width of the belt, making it possible to exert great pressure without tearing or otherwise damaging the belt. Load is absorbed by the

NO GREAT EXPERIENCE IS NEEDED to grind carbide tools by abrasive belt method. "Off-hand" grinding produces good results—or fixtures can be added for accurate grinding of tool angles

WIDE FACE OF CI GRINDING PULLEY in close contact with entire belt face permits heavy pressures. Worn belts or new belts with grease can produce finishes as low as 1.25 mu rms

CARBIDE

BY GEORGE H DeGROAT, ASSOCIATE EDITOR

cast iron pulley face and any scoring or grooving that may result from constant pressure in one section causes little trouble because the face is sufficiently wide to allow moving the tool to a new, unscored, area. Should the pulley face become badly grooved it is easily resurfaced.

Comparison of belts with diamond wheels

Surface speeds of belts are considerably lower than those used with diamond wheels, being 2350 sfpm as compared with usual wheel speeds of 5000 sfpm. Silicon carbide belts of 150, 220, 280, and 320 grit cut very rapidly when new; usually exceed the cutting efficiency of diamond wheels of the same grit. This is largely because of structural differences between belts and wheels. Diamond particles on a wheel protrude less from the matrix than do the abrasive particles on the belt, consequently the depth of cut is greater per particle on the belt than on the wheel, resulting in faster stock removal.

Naturally, with the rapid cutting action, new belts cut rougher, however, abrasive belt greases improve surface finishes considerably. A worn belt also improves surface finishes—even beyond that obtainable with a conventional diamond wheel. For example, a 10 mu rms finish was obtained with a worn 150 grit belt and 5 mu rms resulted with a 320 grit belt. It has even been possible to obtain finishes as fine as 1¼ mu rms with very fine grit belts. New belts without grease usually provide finishes varying from 25 mu rms for a 150 grit belt to 15 mu rms with a new 320 grit belt.

In all cases, the cutting edges of the tools ground by the abrasive belt method showed definite improvement over the edges produced by diamond wheels. There were fewer serrations and those present were not as deep as those produced by a wheel. It is believed that this improvement in cutting edge profile is a result of the cushioning effect of the cloth or paper backing of the belts.

In vitrified diamond wheels there is no absorbing property to reduce the impact of the diamond particle on the carbide. As a result, the rapidly revolving wheel with its projecting diamond particles acts as a hammer on the sharp edge of the carbide tip, breaking comparatively large sections from the tip when a large diamond particle hits it. On the other hand, the belt is resilient enough to give a little when grit hammers on the cutting edge of the tool. This reduces the possibility of fracture in grinding and

ESTIMATED COST OF ABRASIVE used in ball grinding carbide tools is 10%, or less, of cost of diamond wheel needed to produce same number of tools

tends to provide a smoother, less serrated edge.

Among the tests run on tools ground by the abrasive belt method was one in which a worn 1-in. sq by 7-in. long carbide turning tool was taken from a duplicating lathe where it had been used for heavy cuts on 5100 ball-bearing steel. This tool was reground on the abrasive belt machine by the lathe operator who was not an experienced tool grinder. Result was a fine finish and the tool lasted 2 to 2½ times longer than did the same tool ground with a diamond wheel.

Tests show promising results

In another test, a set of single-point carbide tools used for turning AMS 5060 and AMS 5010 steel were ground with a 220-grit paper-backed belt and were compared with new tools ground with a 120-grit diamond wheel. The first tool produced 190 pc before resharpening was necessary, the second made 211 and the third, 206. An average of 120 pc per tool grind was achieved with tools ground by means of the diamond wheel. In rough cutting AMS 5665 nickel-alloy steel, another belt-ground carbide tool produced 23 pc before resharpening was required, a second did 39 pc and a third produced 40. For the same job, diamond-wheel-ground tools produced an average of 12 pc per regrind.

In tests comparing surface finishes produced by the two methods, several tools with brazed carbide tips were completely formed with a 220 grit vitrified diamond wheel. Photomicrographs of the cutting edges were made at 100 X for comparison with results obtained by belt grinding. Surface finish of each tool was checked with a Profilometer—the readings being made within 0.010 in. of the cutting edge proper. Later, surface finish readings were made on the same tools after they were reground with abrasive belts. The same Profilometer was used under exactly the same conditions.

Each tool was reground with an abrasive belt to remove all traces of the finish left by the diamond wheel. Where *new* belts were used, surface finishes were somewhat rougher than those obtained with the wheel. For example, the original finish produced by the 220 grit diamond wheel on one tool was 10 mu rms. After regrinding with a new 220 grit silicon carbide belt, the finish was 14 mu rms.

Another tool was treated in the same manner except that grease was employed with a new 320 grit belt. This provided equal finishes—both readings being 6 mu. rms. Other tools were reground with 'old' belts, used belts worn to a degree where, instead of fresh, sharp grit, the original grit had been broken down to about one-half its original screen size.

An 'old' 320 grit belt for instance, has characteristics similar to those of a new 600 grit belt. In each case, tools reground with such belts had finishes superior to the original. A typical reading showed a finish of 5 mu rms for a tool reworked with an old 220 grit belt as compared with a 7 mu rms original finish produced by the 220 grit diamond wheel.

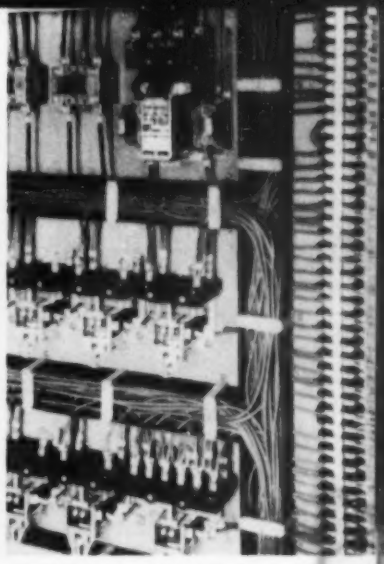
Conclusions gained by these tests were that grease used with new abrasive belts improved surface finishes to the point where a new 320 grit belt will produce a finish at least equal to that obtained with a 220 grit diamond wheel. Moreover, a worn belt improves surface finish beyond that obtainable with a 220 grit wheel.

The abrasive belt method appears to be a completely satisfactory method for the off-hand grinding of carbide-tipped tools. The necessary equipment is fundamentally single and inexpensive and fixtures for highly accurate requirements can easily be designed for use with it.

Fiber Ducts Save Time in Wiring Machine Panels

BY RICHARD T JOHNSTONE
Chief Draftsman,
SNYDER TOOL & ENGINEERING CO

WHEN WIRING IS COMPLETE, covers are placed over ducts and fastened with wingnuts



WIRING IS LAID in U-shaped fiber ducts with holes through which it passes to devices

In the past few years, there has been a trend toward cable wiring of electrical control panels in the machine-tool industry. Cable wiring consists of connecting the various devices with multi-strand, flexible, plastic-covered wire, tied in neat bundles with individual leads peeling off from the bundle at appropriate points where they are to be connected to the device. The most prevalent earlier method, known as flat wiring, consisted of connecting devices with solid wire bent and fitted to lie flat against the panel board where it was held in place with straps.

The cabling method offered several advantages over flat wiring: a more compact panel, more mechanical stability (because the multi-strand wire does not break readily as the result of vibration), additions or corrections more easily made without detracting from panel neatness, and adaptability to mass production by assembling the wiring as a harness on a separate frame.

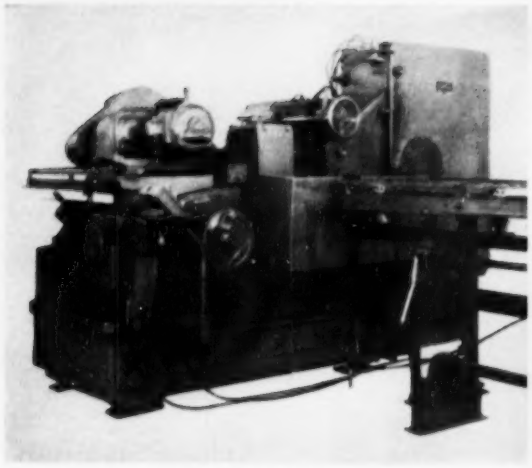
For two years we used the cable method of wiring entirely. Our experience during this period brought out several disadvantages for our type of production. For one thing, considerable time and thought is necessary in planning a panel layout to insure a neat wiring harness. As a man wires the panel, he must progress from one device to the next, connecting all wires to each in turn, planning length and destination of each new wire and being careful not to miss the termination of a previously started wire. To insure a mechanically secure wiring job, the bundles of wire must be laboriously tied at frequent intervals with stout cord.

As our product consists of individual, special machines of which only a few of one particular design are built at a time, it was felt that a wiring method could be developed, which, while possibly not suitable for mass production, would overcome these disadvantages. After several systems were considered and discarded, a system ideally suited to our needs was developed in which U-shaped fiber channels are fastened to the panel board above rows of devices. The open face of a channel is up and the sides are perforated with holes about $\frac{3}{8}$ in. in dia. Wires are laid in the channel and the ends pulled through the holes to connect the various devices. Junctions between horizontal and vertical runs are made by slotting the side of one channel and fitting the open end of the other to it. When the wiring is complete, covers are fastened over the open face by means of wingnuts on studs extending from brackets and protruding through holes in the cover.

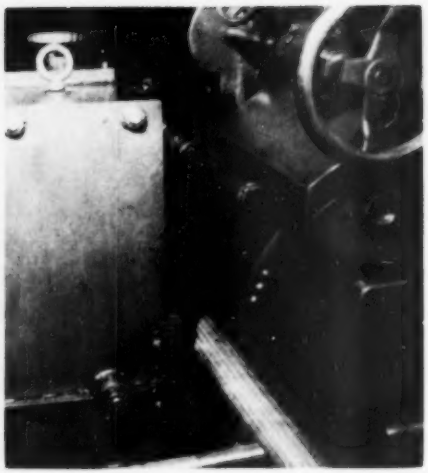
In wiring a panel by this method, a minimum of planning is necessary. Once the devices are mounted, connections between them may be read directly from the schematic drawing. A wire is measured, cut to length, the ends are skinned, it is laid in place in the channel and connected. No particular care is required in placing the wire, and once in place, it may be checked off the schematic and forgotten.

When the wiring is complete and the covers in place, the panel presents a neat, workmanlike appearance. The wires are mechanically secure and the fiber channel prevents the insulation from being punctured where the wires pass through holes in the channel. If alterations are necessary, they are easily made because wires may be removed or new ones added without having to cut and retie bundles at numerous points. This should prove advantageous in maintenance work, too.

We have found that there is a considerable saving in manhours in constructing a panel by means of this method as compared to the use of flat wiring or cabling. There is a noticeable saving in wire resulting from cutting wires to the correct length immediately rather than leaving a safety surplus, to be trimmed later, as required in cabling. We find also that new personnel are trained more readily in this system.



ONE POUND OF STOCK in one minute is removed in grinding 15-foot long stainless steel tubing with this centerless belt grinder using a lubricated abrasive belt. Machine was built for grinding stainless tubing produced by Ugine-Sejournet process—removes taper and extrusion die marks



TUBING IS FED to grinding belt by an abrasive regulator belt having a variable speed drive providing a feed rate ranging from zero to 30 ft per min. Greatest advantage of setup is ease with which work feed angle of regulator belt can be changed to reverse work for more than one pass

Wet Belt Grinding Speeds Production

A new grinding process will remove 2 lbs of stock from a 15-ft length of 2.375-in. O D stainless steel tubing in 2 minutes. The rate of stock removal was made possible by using lubricated abrasive belts in a centerless belt grinder, described here.

BY DIRCK OLTON, Products Engineering Dept. DR. HUGH N. DYER, Technical Dept., BEHR-MANNING Corp., Troy, New York

THE grinding of extruded tubing in centerless belt grinders was developed primarily for grinding stainless steel and high alloy tubes produced by the Ugine-Sejournet process. In making tubes by this method, a steel billet is forced through a die with the I D of the tube being generated by a piercing mandrel. Fibreglas is used as a lubricant. Rough surfaces resulting from high pressures necessitates grinding the O D of the tube.

Machine Uses Two Grinding Belts

Two coated-abrasive belts are used on a new machine built by the Production Machine Co., Greenfield, Mass. A 50-grit aluminum oxide, waterproof cloth, abrasive belt, 9 in. wide and 168 in. long, does the grinding. The work is fed past the grinding belt by a 220-grit aluminum oxide, waterproof cloth abrasive regulator belt 9¾ in. wide and 58 in. long.

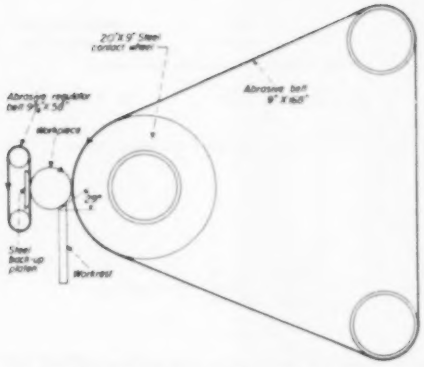
Belt is Oil Lubricated

A cutting oil lubricates the grinding belt. Sprayed on the belt by a manifold nozzle, the recirculated lubricant flushes away the grinding swarf and prevents rewelding of the chips.

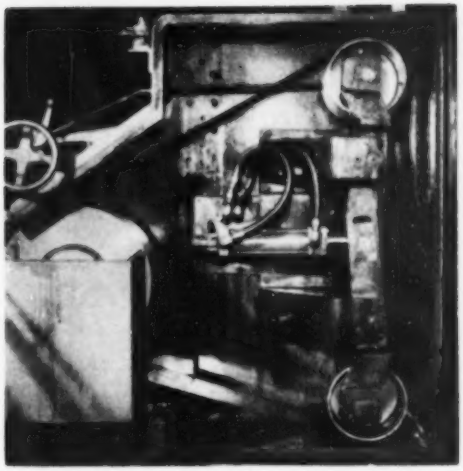
A steel contact wheel weighing about 350 lb is mounted on a 4-in. shaft and supports the grinding belt against the work. The use of steel contact wheels is a new concept in grinding with coated-abrasive belts. In addition to backing up the belt, the steel wheel serves as the drive pulley for the belt. Driven by V-belts from a 25-hp electric motor, the 20-in.-dia wheel forces the belt past the work at speeds of 3500 to 10,000 sfm.

Adjustable Regulator Belt

The regulator belt assembly consists of the coated-abrasive belt, a variable speed 2-hp drive, an idler pulley, and a flat steel backup platen which holds the regulator belt against the work. This entire assembly can be adjusted about a horizontal axis to provide a work feed angle of zero to 15° in either direction from the vertical. This angular adjustment, together with



WORK REST is positioned to maintain sufficient pressure between workpiece and the regulator belt. Steel backup platen holds regulator belt against work



STEEL CONTACT WHEEL is new idea in grinding with coated-abrasive belts. Steel wheel serves as a drive pulley for the belt and is rigidly mounted in ball bearings to prevent deflection under higher pressures

# of Extruded Cylindrical Stock

the variable speed drive, makes possible an infinitely variable work piece feed rate from zero to 30 fpm. The coated-abrasive regulator belt, operating over a rigid platen, offers a decided advantage over rubber-bonded regulator wheels, as used in conventional centerless grinders because the work feed angle of the coated-abrasive regulator belt can be changed at will. A rubber-bonded regulator wheel, on the other hand, must be reshaped whenever the work feed angle is changed.

Work Piece Control

The regulator belt, with its variable speed drive, controls the rotation of the work against the grinding belt. To maintain sufficient pressure between the workpiece and regulator belt for good control, the workrest is positioned between the regulator belt and the grinding belt.

The regulator belt is $\frac{3}{4}$ in. wider than the grinding belt, the extra width being extended on the infeed side of the machine to start the workpiece rotating before it reaches the grinding belt and cutting begins.

Uniform Pressure Across Grinding Belt

By setting a small taper between the contact wheel spindle and the face of the backup platen a uniform rate of stock removal is maintained across the entire width of the grinding belt. As a result of uniform pressure across the face of the belt, dimensional accuracy is assured throughout the life of the grinding belt. Because of the rigid construction of the machine, and its high ratio of horsepower to belt width, (nearly 3 hp per inch of belt width) extremely high grinding pressures can be developed without difficulty.

Full advantage is taken of the inherent ability of coated-abrasive belts to remove tremendous quantities of stock without overheating the work and causing burning, distortion, and loss of dimensional accuracy. Production rates are excellent and the simplicity of the operation promotes efficiency.

Grinding Results

The main objectives of this method of grinding are: (1) to remove stock from the extruded tubing at a rate faster than any other method of grinding; (2) to remove the Fiberglas skin and extrusion die marks; (3) to remove taper from the tubing (up to 0.020 in. per 15 ft length); and (4) to provide an acceptable finish on the tubing. Tests have demonstrated that the coated-abrasive belt grinding process with cutting oil as a lubricant will accomplish these objectives.

This grinding method is also adaptable for rapidly grinding bar and tube stock of all types. Although stock removal and not surface condition was the major consideration in finishing the extruded tubing, 20-30 microinch finishes are readily obtainable with fine-grit belts. Tolerances of plus or minus 0.001 in. taper, end to end, are consistently held.

How To Design Diamond Pin Locators

Calculate locators correctly for the job characteristics

By E J LaBROAD, Chief Tool Engineer
ASSOCIATED ENGINEERS, INC
Boston, Mass.

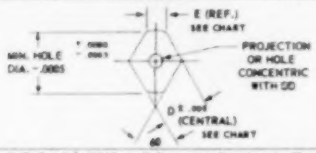


Chart for Determining the E (Ref) & D ±.005 (Central) Dimension, Based on the Three Formulas:

(1) $A = \frac{C^2 - B^2 - K^2}{2K}$ (2) $D = 1.732A + \sqrt{B^2 - A^2}$ (3) $E = 2A$

K = 1/2 the Sum of the Component Part Print Center Distance Tolerance & the Component Fixture Center-Distance Tolerance
C = Radius of Minimum Locating-Hole Dia
B = Radius of Maximum Pin Dia
A = 1/2 Width of Pin Flat

MAX. PIN DIA.		.1245	.1870	.2495	.3120	.3745	.4370	.4995	.5620	.6245	.6870	.7495	.8120	.8745	.9370	.9995
K = .001	E	.030	.046	.062	.077	.093	.108	.124	.140	.155	.171	.186	.202	.218	.233	.249
	D	.087	.130	.174	.217	.261	.305	.349	.393	.437	.480	.524	.568	.611	.655	.699
K = .0015	E	.020	.030	.040	.051	.062	.072	.082	.092	.103	.113	.123	.134	.144	.155	.165
	D	.077	.117	.157	.197	.237	.277	.317	.357	.397	.436	.476	.516	.556	.596	.636
K = .003	E			.017	.023	.028	.033	.038	.044	.049	.054	.059	.064	.070	.075	.080
	D			.139	.176	.211	.246	.282	.318	.283	.389	.425	.460	.496	.531	.567
K = .004	E				.015	.019	.023	.027	.031	.035	.039	.043	.047	.051	.055	.059
	D				.169	.204	.239	.273	.307	.343	.377	.411	.446	.480	.515	.550
K = .005	E						.017	.020	.023	.026	.029	.032	.035	.038	.041	.044
	D						.230	.267	.301	.335	.369	.403	.437	.471	.505	.539
K = .006	E							.015	.017	.020	.023	.025	.028	.030	.033	.036
	D							.262	.295	.329	.362	.396	.429	.463	.496	.530

To Find Maximum OD of Pin for Figures Not Shown Use the Following Formulas:

Formula "A" (1) $B = \sqrt{C^2 - K^2 - .816K}$ (2) $D = 1.386 + \sqrt{B^2 - .000864}$ (3) PIN OD = 2B

Formula "B"

JIG. BORE TOLERANCES TO BE USED WHEN:

PART IS	±.0005	±.001	±.002	±.003	±.004	±.005
TOOL IS	±.0005	±.0005	±.001	±.001	±.001	±.001

Many of the diamond pins in jigs and fixtures I've seen recently had corners either filed or stoned to make them less difficult to load. When the center distance of the part and the fixture were found to be within tolerance, the diamond pin was checked. This check showed that the flat, or amount of locating surface, on the diamond pin was too large; was based on being either 1/3 or ¼ of the locating diameter. This 1/3 or ¼ rule is approximately true, but only under certain conditions: *Where ½ of the sum of the part center-distance tolerance and the tool center-distance tolerance is equal to 0.001 in. or less.*

For any other condition, *this rule is not true.* In fact, if the rule is used, interference will occur between the hole and the diamond pin. Hence, the machine operator will tend to relieve the corners to permit the part to drop over the pin. This, by itself, is not too serious, except that the machine operator has altered the control of the pin. Also, in relieving the corners, the operator may alter the diameter. This will always result in excessive radial movement of the part, and parts machined out of tolerance.

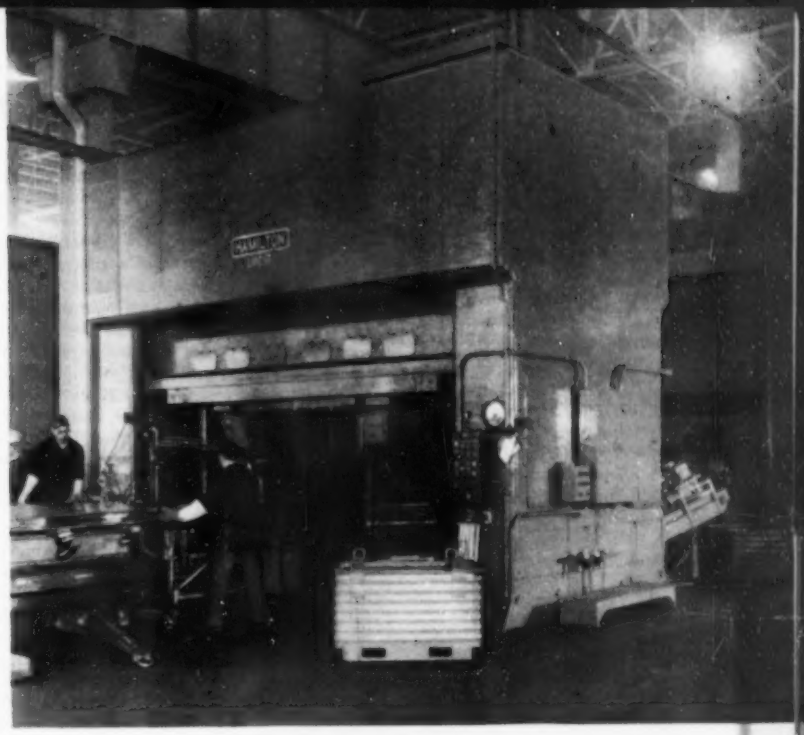
To prevent the machine operator from altering the diamond pin, we have derived the formulas and the chart shown. If the pin is properly designed, there should never be any need for the machine operator to touch it. In fact, he should be forbidden to touch it; should call his foreman when trouble occurs.

The chart was based on part center-distance tolerances and tool center-distance tolerances, as shown in "A", with the diamond pin from 0.0008 to 0.0005-in. loose in the minimum-diameter locating hole. Also, the minimum flat allowable was approximately 0.0015 in. — hence, in some cases, no figures appear on the chart. For these cases, chart "B" should be used where a 0.016-in. flat is established and the maximum diamond-pin diameter and distance across the flats are sought.

When formulas "B" have been used and the diameter is determined, reexamine the setup to be certain that the radial movement of the part is not in excess (pivoting from the full pin) of the tolerances specified on the part drawing. If this radial movement is excessive, the part-drawing center-distance tolerance must be held closer. If this is not possible, some method, other than a full pin and diamond pin, must be used for locating.

Several drawings I've checked show that the pin was incorrectly dimensioned. The dimension across the flat (E) was given instead of the dimension (D). This forces the toolmaker, if he is to make an accurate diamond pin, to calculate the (D) dimension.

The (D) dimension *must* be given, while the (E) dimension is provided only as a reference. For inspection after assembly, provide a projection or hole ground concentric with the diamond-pin diameter.



pressline for floor panels at new Buffalo stamping plant is fully automatic. Plant contains...

LATEST IMPROVEMENTS IN PRESS AUTOMATION AT FORD

BY MILES J ROWAN, ASSOCIATE EDITOR

Ford's new Buffalo stamping plant was built from the ground up for efficient production of stampings. As a result it contains all of the features that Ford engineers feel are essential, both in obtaining maximum effectiveness from equipment and in making press operations as safe and as easy as possible. One of the most important of these is automation — essentially, automatic mechanized handling of material into, out of, and between, presses. Through automation, Ford eliminates many fatiguing manual loading, unloading, and positioning operations. Relieved of this burden, men are upgraded to control machines and to apply their skills to jobs that require human dexterity and ability. Operator safety is increased and presses operate at a much higher percentage of full productive capacity.

While automation is not new, many of the devices now in use at the Buffalo plant are greatly improved over those first employed in automotive press shops. In the main they are simpler, more easily maintained, and provide much greater flexibility of operation. This report briefly describes the major plant features that Ford engineers feel are most important in realizing the full production potential that automation makes possible, then describes in detail the major improvements that have been made in presswork automation since Ford's program first was described in *American Machinist* more than four years ago (*AM*—Oct 21 '48, p107).

American Machinist SPECIAL REPORT NO. 324 TO THE METALWORKING INDUSTRIES

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HOW FORD GETS THE MOST OUT OF

Ford's new Buffalo stamping plant produces body parts for Ford, Mercury, and Lincoln cars—doors, body side assemblies, dash, floor pan, roof, and other panels that are large, heavy, and hard-to-handle. Yet, despite the problems in handling large parts, through a series of operations, equipment operates at close to full productive efficiency and relatively little manual effort is involved. Making this possible is automation.

Buffalo, however, does not expect automation devices alone to provide maximum utilization of equipment. Die design has been carefully planned to make automation fully effective. So has plant layout, materials handling, materials storage, and trimmings disposal. Type of press, ease of maintenance, and method of installation also were planned to improve over-all plant performance. All of these things, taken together, enable the Buffalo plant to obtain the full production potential that automation makes possible.

LAYOUT AND HANDLING

Layout is direct-line with raw material coming in on one side of the building, going down 19 major presslines, through assembly, storage, and on to shipping on the opposite side of the building. Outside the pressline, handling is mostly by industrial truck and overhead crane, with trolley conveyors feeding some assembly operations and serving the shipping dock.

While adequate storage space for completed parts is necessary in all plants, it is particularly important when automation is employed. There must be equipment to take pieces off the end of the line rapidly and space so large quantities can be held. Buffalo has adequate storage space to permit long press runs and thus obtain greatest effectiveness from each setup.

UNDER-DRIVE PRESSES

Presses in the major lines are high-speed underdrive models equipped with the latest developments in safety, electrical, and air-control devices. Drives and electrical equipment are in the basement. The area beneath these units is kept clear at all times for ease and speed of maintenance or repair. Direct drives are employed to eliminate flywheel and clutch maintenance.

Triple-action presses are installed for the draw operations at the head of each line, followed by suitable single-action presses. With the exception of trim presses, single-action presses are equipped with die cushions for flanging and other final-forming operations. All presses have ample die space.

Presses are to JIC standard so die changes and die build-ups can be made with minimum time and material. Each press has its own standard bolster plate with pressure pin holes in a common location.

For flexibility when layout changes are necessary, presses in the major lines are installed on a grid of heavy girders and can be moved lengthwise in the bay. There also are a number of smaller presses in a miscellaneous press section of the plant. These are completely portable and, by simply disconnecting electrical wiring and air pipes, can be moved by crane in a matter of hours.

Blanking operations are performed in the receiving area near the head of the major press lines. For body quarter panels, a 180-in. press with an electronically controlled uncoiling unit is employed. Coil stock up to 72 in. wide and weighing as much as 20 tons can be blanked.

IMPROVEMENTS IN AUTOMATION

One of the major developments in automation design is to eliminate mechanical drives that are direct-connected with the press. Devices now are powered by air cylinders that are an integral part of the unit. Limit switches and electrical controls synchronize their operation with that of the press.

In a typical cycle, the operator starts the sequence when he trips the press. After the press strikes, the ram, on its upstroke, trips a limit switch that causes the extractor to remove the completed piece from the die. It also trips a second limit switch causing the blank loader to feed the next blank into the die. Additional limit switches on the loaders and extractors control specific details of the operation of these units.

Application of electrical control to automation equipment makes possible faster-acting devices and simplified designs. Safety is increased as there are no fast-moving levers overhead. Drives are located below or at the side of the automation equipment and are much more readily accessible for adjustment or maintenance. As automation units are mounted on casters or on a pivoting frame attached to the press column, all units can be moved aside quickly leaving the entire tooling area open.

This feature permits ready change-over from one set of dies to another on automated lines. Modern automation devices can be moved out of the line in a matter of minutes. As they are self-contained units, nothing is left hanging on the press to encumber conventional press operation. This flexibility is a real advantage for lines on which volume is not high enough to justify steady runs on one set of dies.

DIE DESIGN FOR AUTOMATION

Successful automation on presswork requires close coordination between automation engineers and die designers. The first step, of course, is to design a die that will make the piece. Automation then must be developed to handle the piece into and out of the die. There are three major features of die design, however, that determine the ease with which automation can be applied and the effectiveness with which it will operate. These features are gages, lifters, and methods of removing trimmings.

Gages are required to locate the blank as it is fed

into the die. They stop the forward movement of the blank and nest it properly for the operation. To insure correct location, the stroke of the loader normally is set to overfeed, with the overtravel being taken up in a spring in the loader drive. Lifters raise the completed piece out of the die high enough so it can be gripped by a mechanical extractor.

Both gages and lifters must be of the disappearing type. Lifters, for example, must act as the ram rises, then drop below the surface of the die for the next operation. Gages, too, cannot be in the working area of the die during the press operation.

While these actions can be produced in a number of different ways, automation engineers at Buffalo favor air cylinders for the close control and precise timing that they permit. One set of limit switches controls cylinders actuating the gages, a second set controls the lifters. Movement of the press ram trips the switches. Timing, therefore, is easily arranged, readily adjusted, and always in correct relation to the press stroke.

REMOVAL OF TRIMMINGS

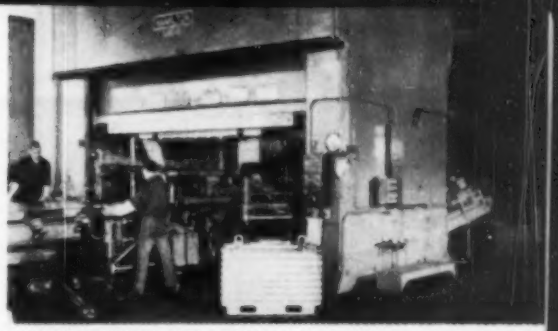
Removal of trimmings can easily bog down the entire pressline unless adequate facilities are provided. At the Buffalo plant, the majority of trimmings drops through chutes at the press to disposal units in the basement. Cutters in the dies reduce the trimmings to sizes and shapes that will slide by gravity over smooth plates to the chute.

Piercing dies are designed with openings in the die shoe to accommodate small belt conveyors or shakers that carry slugs out to the chute. For small pieces that would tend to work under the belt and cause excessive wear, a small Ford-developed vibratory conveyor is employed. Driven by a small air motor, this conveyor requires virtually no maintenance and is expected to take over many of the jobs now being handled by belt.

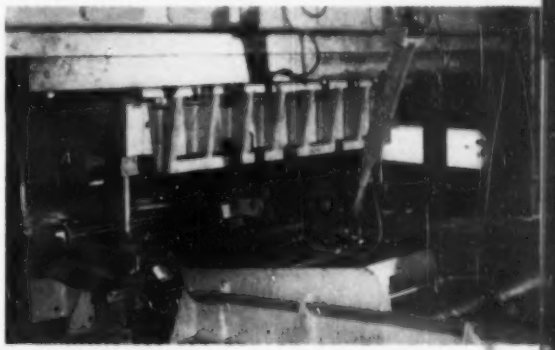
With the die properly designed so trimmings fall away from the die automatically and with scrap-handling activities concentrated in the basement, no time is lost for disposal of trimmings and the working area of the main press floor is kept clear.

FULLY AUTOMATIC LINE

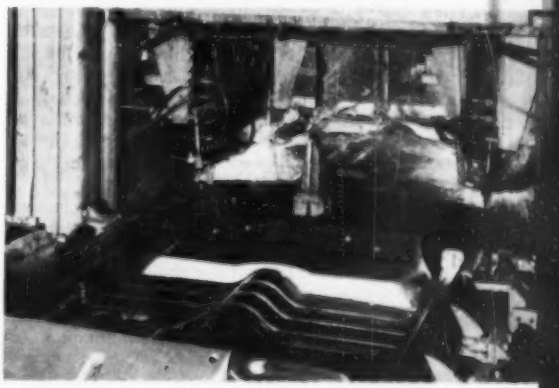
An outstanding example of automation in presswork is Line 17. On this line, front floor panels move through three stamping presses and four welding presses without manual handling after the sheet is placed in the blank loader on the first-operation press. In addition to fully mechanized handling, Ford engineers have arranged for automatic operation of the presses and welders. Floor panels are produced in a continuous sequence of operations with machines timed and synchronized automatically by electric control circuits. Operators simply watch the presses. In this way, maximum effectiveness is obtained from the presses with greater safety to operators and with less heavy lifting.



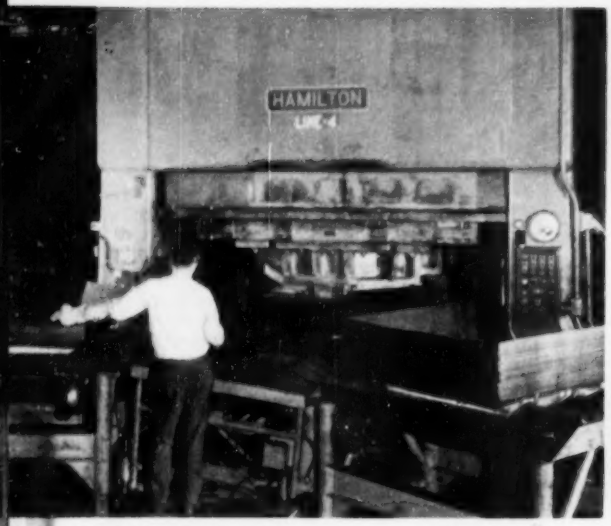
COMBINED STAMPING AND WELDING LINE on which front floor panels are produced is fully automatic except for feeding sheets into blank loader. Thereafter, panel moves into, out of, and between presses without operator effort. Movement to welding press in background also is fully mechanized. Control over automatic operation of line begins at final welding station and works back to first press. Automation devices are synchronized with press cycles



EXTRACTION OF PANEL from first press is accomplished with simplified version of iron hand. Construction is lighter and control is through limit switch on right column rather than from rocker arms and cams as was the case with earlier types. Extractor drops work on indexing chain conveyor that moves panel to loader of next press in timed sequence. Automation between second and third press is same as above. Automation greatly increases operator safety



AUTOMATIC WELDING follows third press operation. Panels travel approximately 40 ft from press up slat conveyor to automatic loading device in foreground. Movement of platen controls feeding of panel. Shuttles automatically move panel from station to station. Reinforcements welded to panel are positioned in fixture by operators at sides of welder. Panel goes through four welding stations



BLANK LOADING OPERATION on outer-door panel line is typical of facilities provided at start of 18 major presslines. Blank loader in front of operator carries sheet directly into dies, eliminating manual loading and greatly increasing operator safety. Operator places blank in loader while press is turning over. As press opens, loader automatically feeds blank. Fork trucks place material in convenient position for loading operation. If jobs require lubrication, compound is applied by spray system. On some lines, timing of spray is controlled by press; on others, operator trips pedal to spray blank. Compound also can be sprayed on both sides of sheet

BLANK LOADERS

Automatic blank loaders not only eliminate dangerous and fatiguing manual operations, but also make it possible to obtain a much higher percentage of the true productive capacity of the press than would be possible with manual loading. Standard operating procedure is to place a blank in the loader while the press is drawing the piece in the die. As soon as the operation is complete, the loader automatically feeds the blank into the press. Timing is split-second and the action of the loader is much faster than could be expected of a man performing the operation manually.

The workplace arrangement at each draw press also has been planned to make the job as easy as possible. Blanks at each press are stacked on tables or racks that are higher than the surface of the loader. Operators need only lower the blanks onto the loading surface. In this way, minimum effort is required for the work that must be done manually.

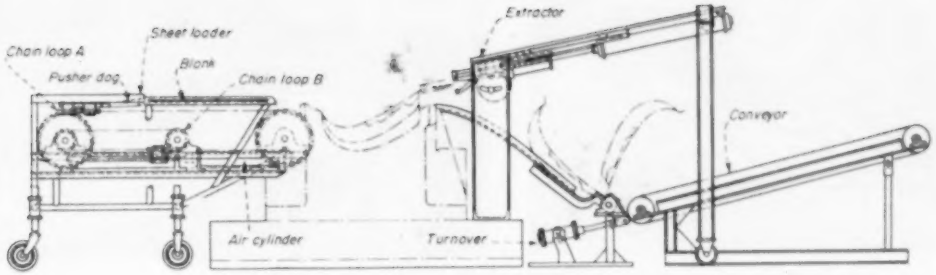
CHAIN-DRIVEN LOADERS

Chain loaders are employed extensively at the Buffalo plant. Dogs, traveling in slots and projecting above the surface of the loader table, push the blank into the die. Dogs are attached to a carriage that travels on rails below the loader table. The carriage is fastened to chain loop *A* operating on two large driven sprockets. Attached to the same sprocket shaft are two small driving sprockets. Chain loop *B* operates on these sprockets and is attached to the piston of the air cylinder. Movement of the piston from right to left moves the carriage from left to right to feed the blank into the press. The chain linkage multiplies the speed and stroke of the piston in proportion to the tooth-ratio of the driven and driving sprockets.

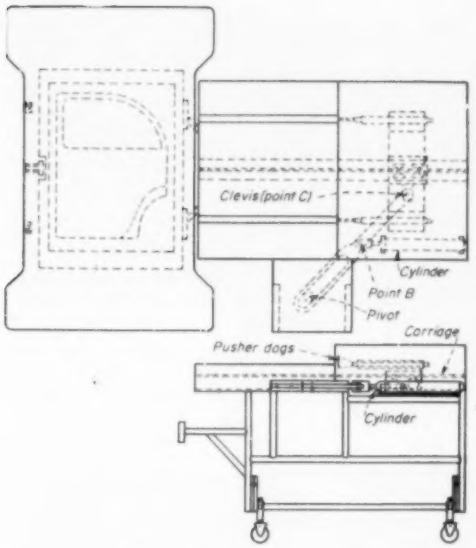
LEVER-ACTUATED LOADER

The method of pushing blanks into the die is the same on both the lever-actuated and the chain-driven loaders. The drive, however, is simpler on the lever-type loader. This design has fewer moving parts, and requires very little maintenance. Performance, however, is equally as good as that of the chain loader. For these reasons, lever-actuation now is specified on all new loaders being designed at Buffalo.

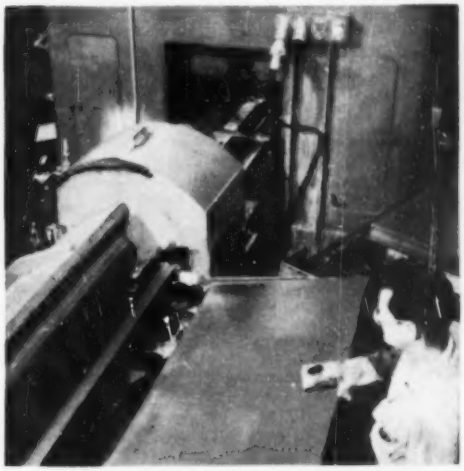
In operation, the speed and stroke of the air cylinder are multiplied in proportion to the lever-arm ratio from the pivot point to *C* where the lever acts upon the carriage and from the pivot point to *B* where the cylinder acts upon the lever.



CHAIN-TYPE LOADER is actuated by air cylinder that moves carriage to which pusher dogs are attached. Dogs which operate in slots, project above surface on which blank rests. Chain linkage multiplies length and speed of carriage travel. Spring on carriage (not shown) provides cushioning effect when blank hits locating gages in die. Limit switches control timing of loader action



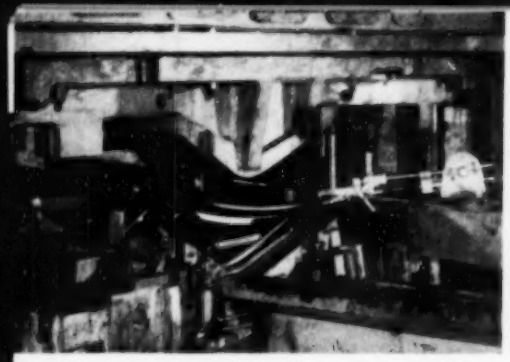
LEVER-ACTUATED LOADER is later design than chain-type, has fewer moving parts, is easier to control, and is much faster. As cylinder acts on lever, stroke of piston is multiplied at clevis because of lever-arm ratios. Slot permits end of lever to move during loading cycle. Cylinder is pivot-mounted so piston can maintain its alignment as lever swings through arc. Limit switches actuate cylinder in relation to press stroke

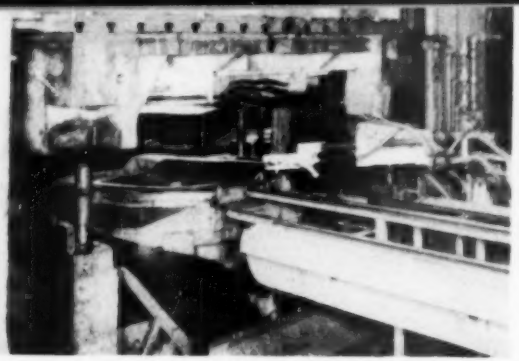


SIDE LOADER IS EMPLOYED on instrument-panel line where a pre-form operation is desirable because of depth of draw in first-operation press. Hole was specified in side of press to permit this setup. Blank fed by operator into pre-form die strikes limit switch that initiates operation. Pre-formed piece is pushed toward press by air cylinder. Piece rolls through automatic spray booth into loading position. Here second air cylinder loads piece into draw die when limit switch on press signals that press is ready for next cycle. Time-delay relay controls first cylinder so piece feeds out of pre-form die only when loading position is open

One of the latest developments in automation is to actuate both the blank loader and the extractor (on the opposite side of the press) from the same drive. Two bars extend through the die to direct-connect the extractor and the loader. One drive (which can be on either the loader or extractor) actuates both units simultaneously. The stroke of each device must be of equal length, but this usually can be arranged without difficulty at the time that the line is being set up.

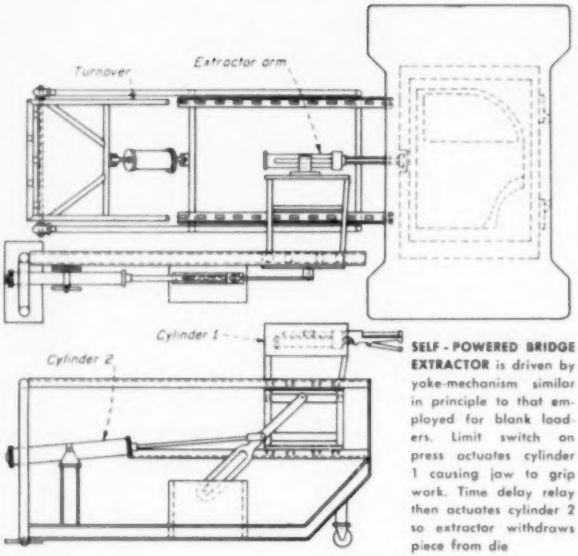
The operation of all blank loaders is controlled by limit switches. On its upstroke, the ram trips a limit switch to start the loading cycle. A second switch, in the loader itself reverses the cylinder when the blank is firmly against the gages in the die, causing the loader to return to its initial position. Changes in the length of the loader stroke can be made by adjusting the stroke of the cylinder. This can be controlled by the location of the second limit switch (the one in the loader).





SIDE EXTRACTOR removes piece from die automatically, is much simpler than the "iron hand". As press opens, jaws advance to grip piece. Extractor is mounted on traveling carriage direct-connected to blank loader at front of press. When loader advances with blank, extractor carriage travels on rail to pull piece out of die. At end of stroke, limit switch causes jaws to open, releasing piece on transfer device that moves it to next press

BRIDGE EXTRACTOR (top right) permits gripping piece on or near its centerline. Extractor in this case is self-powered. Movement of entire bridge assembly is produced by air cylinder controlled through limit switches. Transfer device shown is latest method for moving pieces between presses. Unit employs only 2 V-belts to move piece along tubular supports. Chutes next to die carry trimmings to containers in basement. Details of extractor are shown at right



SELF-POWERED BRIDGE EXTRACTOR is driven by yoke-mechanism similar in principle to that employed for blank loaders. Limit switch on press actuates cylinder 1 causing jaw to grip work. Time delay relay then actuates cylinder 2 so extractor withdraws piece from die

EXTRACTORS

Automatic extractors are equally as important as loaders in obtaining maximum press efficiency. Everything that the loader contributes at the front of the press is matched by the extractor in eliminating hazard and manual handling from the unloading operation. The two units work as a team to provide greater output and better working conditions.

Extractors at the Buffalo plant have been greatly improved over the "iron hand" originally designed for mechanical piece-removal some years ago. Units are much smaller, simpler, less costly to maintain, easier to adjust, and more readily removable.

Flexibility is considerably increased. The extractor shown upper left, for example, is adjustable through approximately 30° about a horizontal axis. The entire unit also can be pivoted about its vertical axis and the total travel of the unit in removing the piece from the die can be adjusted by changing the stroke of the air cylinder by which the extractor is driven.

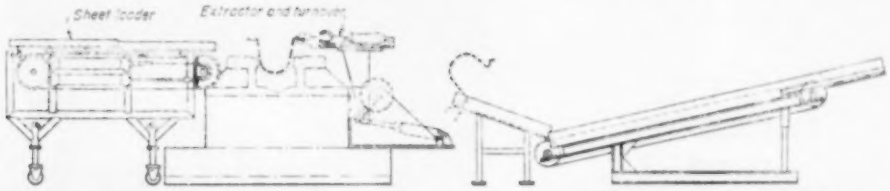
Extractors are no longer mounted on the press overhanging the die and are not powered mechanically from the press. Many are mounted in a frame that can be wheeled out of position for easy access to the die, upper right. On others, the frame is attached to the press but pivots out of the way for die maintenance, upper left. With the frame out of position, the press can not be tripped.

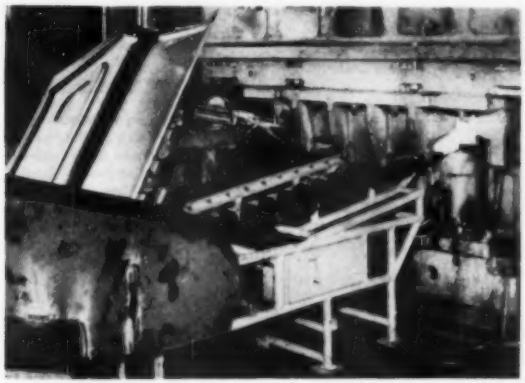
LIMIT SWITCH CONTROL

Operation is by air cylinder and control is through limit switches as explained in the accompanying caption. Side extractors are most common, but the bridge type has been developed for applications where it is desirable to grip the piece in the center. On one press, two extractors are employed. These are mounted on a beam that spans the width of the die so both extractors grip at the side of the piece. Side extractors do not interfere with subsequent operations, such as turn-over, and thus these operations can be performed with less space between presses. With the overhanging type, it was necessary to allow space for the work to clear the extractor before the piece could be turned over.

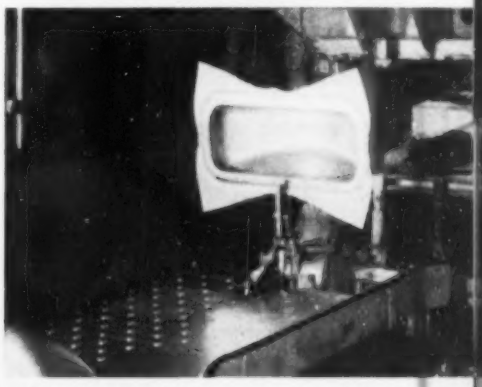
TURNOVERS

COMBINATION EXTRACTOR-TURNOVER is air-powered. Cylinder pulls lever to rotate shaft on which large gear is mounted. Movement of this gear through one quadrant rotates small gear to pivot extractor through approximately 135°. Full automation through die includes automatic blank loader, extractor-turnover, ball transfer, and inclined belt conveyor that carries piece to next press. Extractor is pictured below right

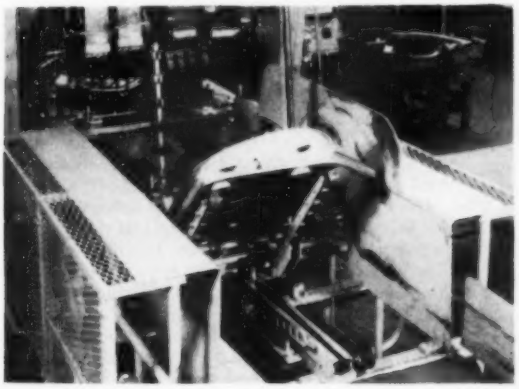




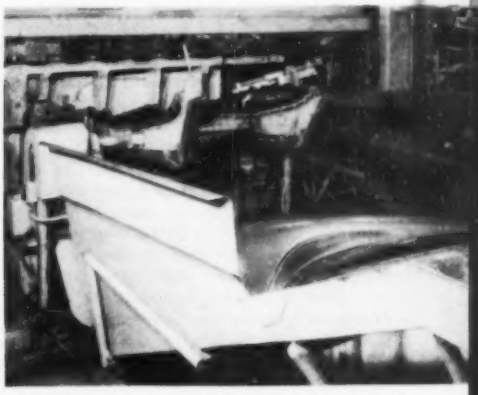
HINGED TURNOVER on outer-door-panel line is actuated by pneumatic cylinder. Panel is removed from die by self-powered side extractor at left, then travels by gravity over specially designed rubber-wheel conveyor section. Piece strikes limit switch controlling cylinder which is direct-connected to hinged section of wheel conveyor. Piece is turned 180° and placed on inclined belt conveyor for delivery to next press



COMBINATION EXTRACTOR-TURNOVER removes tire well for luggage compartment from draw die, turns it 180°, and places it on ball-transfer. Operation is performed in one continuous motion with limit switches controlling action of device and synchronizing its operation with press cycle

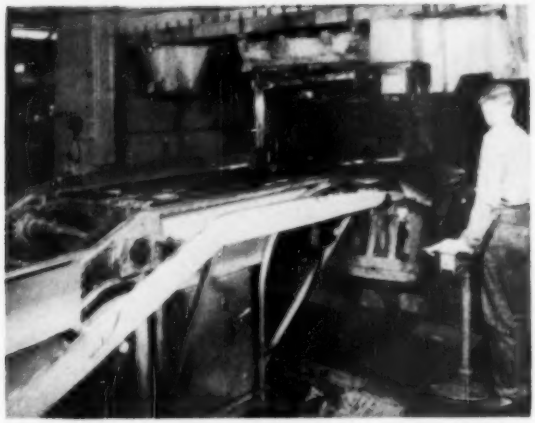


"BUTTERFLY" TURNOVER IS mechanically synchronized with press cycle. Rise of platen in welder causes both pairs of support arms to rise in an action similar to that of the wings of a butterfly. When platen descends, arms return to horizontal position. As door assembly is under control of arms at all times, danger of damaging assembly during turnover is avoided. Limit switches control ejection from welder and from turnover



ROTARY TURNOVER turns complete roof panel 180° and places it on chain conveyor for delivery to automatic loader at next press. Side extractor pulls panel from die, across wheel conveyor, and into turnover. Limit switch causes device to rotate 180°. Turnover is powered by electric motor that drives through slipping clutch to provide the intermittent motion required. Cradle of turnover is identical on both sides of horizontal centerline

TRANSFERS and PRESS LOADERS



AUTOMATIC PRESS LOADER feeds roof panel into trim press without manual effort on part of operator. Inclined chain conveyor moves piece into position on loader. Piece is supported by tubular frame and carriage that is powered by direct-connected air cylinder and travels on rails below frame. Dogs on carriage engage end of panel. Then, when cylinder is actuated by limit switch on press, carriage advances to slide panel off frame into die. Operator merely watches to insure correct feeding, then trips press

In a typical automated pressline, blank loaders feed material into the first press automatically, with automatic application of compound where necessary. Mechanical extractors remove the piece from the die after the operation is complete. Loaders may be of several types and a number of variations on the basic side extractor are possible. If the piece needs to be turned over, this also can be done automatically with several different devices. The turnover for the extractor places the piece on a conveyor for transport to the next press.

At present, a number of different types of conveyors are employed on the major lines at the Buffalo stamping plant. Included are standard portable inclined belts and flat conveyors, as well as special Ford-designed continuous chain, indexing chain, and V-belt transfers. Often a specific type is indicated by the requirements of the particular transfer to be made. For example, roof panels are turned over after the first operation. To conserve space between presses, the large, heavy panel then is conveyed up a steep incline to an automatic loader at the second press. A chain conveyor with pusher dogs performs this transfer.

In normal operation on lines of this type, a smooth rhythm develops to keep presses running steadily much of the time. Automatic loaders on second- and third-operation presses are actuated by a limit switch on the press in the same way as blank loaders at the first operation. While the press is working, the conveyor delivers a panel to the loader. As the press opens, the loader pushes the panel into the die, then returns to its initial position ready for the next piece as the operator trips the press to start the next cycle.

One of the latest developments in transfers is a V-belt model designed at the Buffalo plant. Two V-belts, one on each side of a supporting frame, move pieces to the next press. When loaded, belts ride on a smooth steel strip in the framework of the unit. Empty, they travel loosely across the surface. As the V-belt transfer is less expensive than other types and requires very little maintenance, automation engineers at Buffalo expect to apply it widely for future transfer needs.

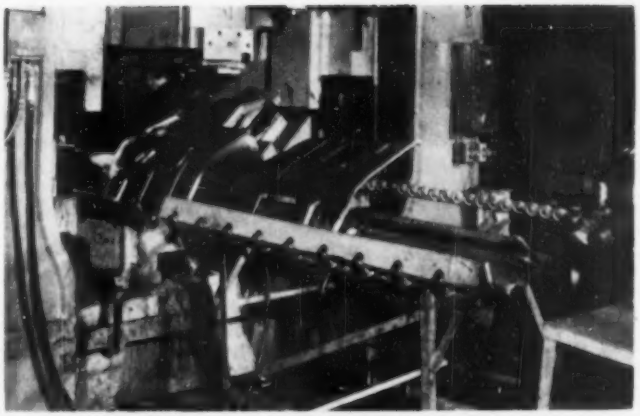
COMBINATION UNITS

While the majority of the automation equipment now in use are individual units, the most recent device developed by the Buffalo stamping plant is a combination of extractor, transfer, and loader in a single unit. This has been designed for the roof-panel line and will be positioned between the second and third presses.

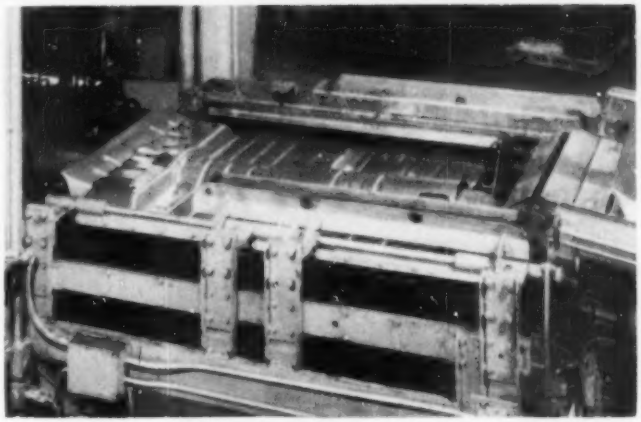
The extractor, in contrast with present designs, will be mounted so its jaws, in the rest position, will be just below the surface of the transfer. In operation, jaws will reach up to the edge of the die, grip the panel, and pull it onto a V-belt transfer. These jaws then will drop back to the rest position to clear the panel as it moves across to a conventional pusher-type loader actuated by air cylinder and controlled by limit switches.

While not nearly as automatic as the lines previously discussed, the line on which upper outer pillars are produced contains a very interesting application of mechanized handling between presses. Dies in a series of four presses have been developd to produce parts as pairs, left and right. Presses are

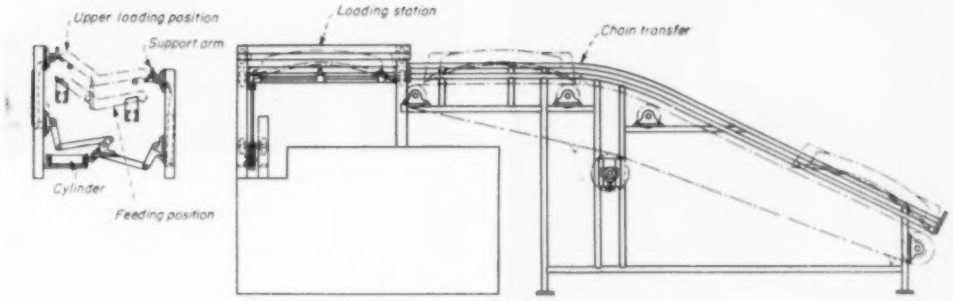
ON-EDGE LOADER is based on same principle as loader for roof panel. Wheel conveyors are arranged to support piece in same position it will occupy in die. Dash panel is shown part way into press. Conveyor for removing trimming can be seen projecting from die below loader.



LOADER FOR WELDING MACHINES is fully automatic. Front floor panel moves up slat conveyor at right and onto L-shaped support arms that hold one panel directly above a second panel on the loading carriage. When platen of welder descends, carriage, powered by air-cylinder, advances to feed panel. When carriage returns, it strikes limit switch causing support arms to pivot downward to drop piece onto carriage. (Photo was taken just after arms had dropped panel). Arms then pivot upward to receive next piece. Panel in upper loading position depresses limit switch. Piece coming up conveyor depresses second limit switch. If both switches are depressed during same time period, conveyor stops automatically. When panel drops to loading carriage, circuit clears and conveyor starts again.

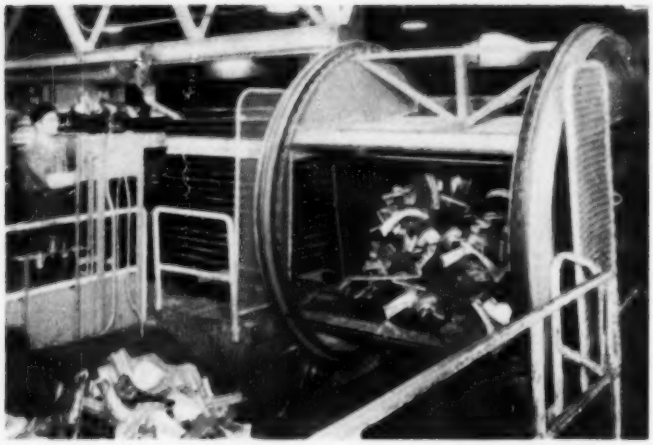


LOADING DEVICE for welding operation on cowl top is similar in principle of operation to the welding loader pictured above. After carriage in feeding position advances to feed welder and then returns empty to its loading position, cylinder through mechanical linkage drops next panel from upper loading position. Control is by limit switch



lined up side by side with one 12-in.-wide belt conveyor in front and one in back, running the full length of the line. Belts are in front of the operator, next to the press, and are located at a convenient working height.

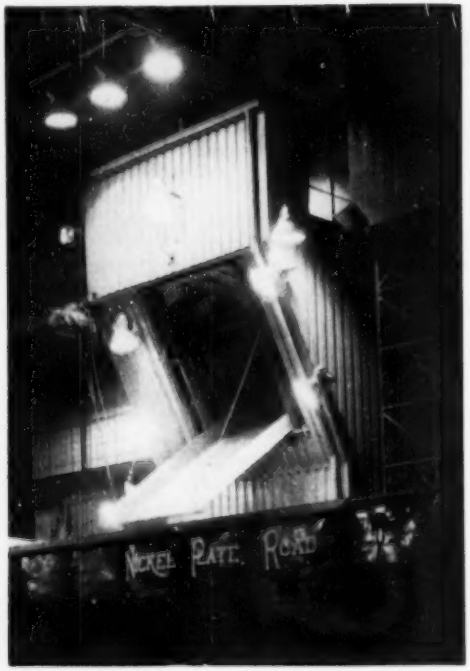
Blanks move along these belts to the first press where operators at both the front and back of the press load, trip, and unload the press. Both must push trip button simultaneously for the press to operate. Partially completed pieces are placed on the belt for movement to the next operation. Trimmings automatically chute onto the same belt. At the end of the line, finished pieces are stacked and trimmings disappear through a chute in the floor.



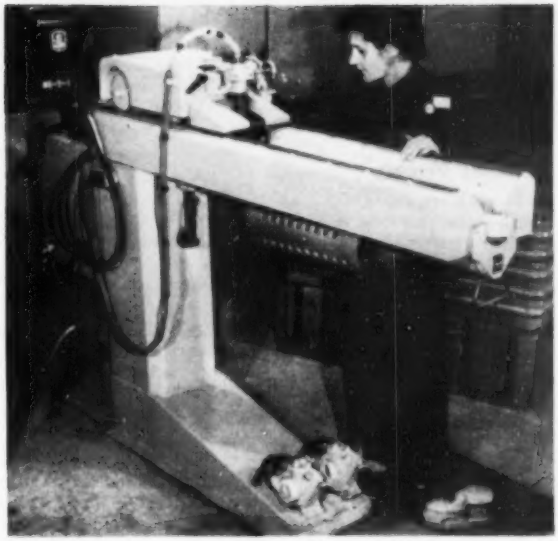
ROLL-OVER DEVICE empties truckload of trimmings into conveyor that feeds directly into baler. Great majority of trimmings produced on major presslines drop through chutes at each press to trucks standing in basement. Trains of loaded trucks are towed by tractor to baling area. Trucks are moved into roll-over by overhead pneumatic pusher behind operator

TRIMMINGS are handled in the basement

PUSHER-CONVEYOR receives baled trimmings ejected from baler at right. Bales are not carried by conveyor, are simply slid along heavy steel plates. Pushers are clearly visible in overhead return section of conveyor. Construction is designed to reduce wear and to lower maintenance costs. Bales are conveyed to outdoor loader



BALE-LOADING STATION is equipped with TV camera that pictures chute and interior of gondola. Baler operator in plant watches progress of loading on TV screen at control board and moves gondola by remote control as car fills. One operator has full control over balers, pusher conveyors, and car movements. No manual handling of bales is required at any point



LONGITUDINAL INERT-ARC FUSION BUTTWELDER was designed and built by Solar to fabricate cylinders from rolled sheet metal. Welder is so reliable that production losses caused by machine breakdown are rare. Depending on material and thickness, welding speed varies from 5 to 50 ipm

NOVEL METHODS ARC WELD HIGH-STRENGTH ALLOYS

BY F G HARKINS,
Chief Welding Engineer and
H C THOMPSON, Weld Technician
SOLAR AIRCRAFT COMPANY
San Diego, Calif

Welding problems on tough, heat-resistant alloys have been overcome at Solar Aircraft by specially developed equipment and innovations in welding technique. Here's the story on seven Solar-developed machines that give high-speed, high-quality welding without the need for highly skilled operators

THE aircraft industry rapidly is coming of age in developing improved production techniques. Because of economic and design pressures, fabricators must constantly review all manufacturing processes with a view to producing lighter, stronger, better-quality components at progressively lower costs.

To meet this challenge, Solar's design, production, metallurgical and welding engineers, working as a team, have developed several novel, high-production, high-quality welding machines and techniques. Among the most interesting of these are a number of innovations in the field of machine fusion welding.

These developments, together with the methods of welding process control employed, enable consistent, repetitive production of difficult welds to high standards of quality. At the same time, highly skilled operators usually are unnecessary—a significant advantage in a tight labor market.

Automatic Welding Equipment

In addition to resistance-welding machines of many types, the current automatic or machine welding equipment at Solar's San Diego plant consists of five major types: (1) inert-arc fusion buttwelders; (2) inert-arc contour buttwelders; (3) inert-arc circumferential buttwelders; (4) shielded inert-gas metal arc welders; and (5) submerged-arc welders.

The longitudinal inert-arc fusion buttwelders were designed and built by Solar for fabricating cylinders from rolled sheet metal. Production buttwelds are made on material ranging in thickness from 0.005 to 0.100 in. without filler material. With filler wire the range of thickness can be extended to 0.218 in.

To a large extent these machines are assembled from components readily available on the open market. The welding generator, carriage, torch, and electrical gear are nationally advertised products. The electrical circuits, frame, and clamping device are Solar developments.

In the interest of simplicity of operation and maintenance, electronic control devices have been eliminated. The high-frequency generators usually employed for

starting the arc, arc length voltage control, electronically controlled wire feed mechanisms, and similar equipment all have been deleted. The machines are so reliable that production losses from machine breakdown are practically nil.

Operating Methods

To use them, the operator merely touches the electrode to the material. This starts the arc and carriage simultaneously. The arc torch moves across the stationary piece carried on a motor-driven carriage. A "Scotch link," which allows for lateral adjustment to compensate for misalignment of the seam, is provided on the torch holder.

Depending on the type and thickness of material, welding speeds will range from 5 to 50 ipm. Welding heats range from 10 amp on 0.005 in. material to 150 amp on 0.125-in. stock. Particularly on the higher-alloy materials, the highest-quality welds are produced at relatively low heats and speeds. Adequate gas coverage probably is the major reason for using the low speeds. For example, at a speed of 10 fpm on material such as *AISI* 321 or mild steel, the weld puddle would be so long that solidification would occur in air unless specially designed gas traps were installed. All air must be excluded to prevent oxidation. A large portion of the parts to be welded at Solar are less than 36 in. long. High speeds on this length would be impractical.

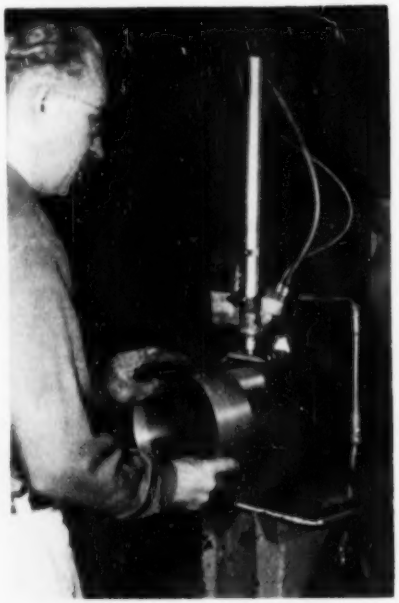
Superalloys such as *N*-155 (20-*Cr*-20*Ni*-20*Co*) show cracking tendencies in the weld and in the heat-affected zone when welded at high heats and high speeds. Best results on material such as Inconel, *N*-155, and *L*-605 in the 0.010 to 0.063-in. thickness range are obtained at speeds ranging from 8 to 25 ipm. Welding speeds on similar gages of stainless steel will be significantly higher than this.

In conjunction with the longitudinal buttwelder, two other machines are employed to complete the operation. These are the tab-tacker and the seam-leveler.

Tab-Tacking Machine

The tab-tacking machine tack-welds tabs to the ends of the seam to be welded to prevent the development of starting and finishing cracks. As the machine performs a subassembly function, the butt-welder operators are not required to spend excessive time in positioning and aligning work in the welder.

The tab-tacking machine is universal in application. It will accommodate cylinders ranging from 2-in. dia upwards. The machine consists essentially of: (a) an *ac* welding transformer with a high-frequency starting device; (b) an electronic timer that controls the duration of the welding current; (c) a magazine that automatically feeds one tab each time the machine is energized; (d) a suitable clamping device which brings the



TAB-TACKING MACHINE is another welding unit developed by Solar to speed, simplify, and make more precise the production welding of aircraft components. One tab-tacking operator can furnish enough parts to keep four buttwelders in operation Machine handles a wide range of cylinders from 2-in. dia upwards

SEAM-LEVELING MACHINE improves tensile and elongation properties of welded parts. On type 321 stainless, tensile strength is increased 14%, elongation 11%. Steel rolls exert pressures up to 55,000 psi on weld

seam into alignment both circumferentially and longitudinally.

Seam-Leveling Machine

The seam-leveling machine essentially consists of: (a) a heavy frame which somewhat resembles a resistance seam welder; its throat depth is 36 in., so, by turning the part end-for-end, a weld seam 72 in. long can be leveled; (b) a pair of hardened steel pressure rolls; (c) an air-operated toggle mechanism capable of exerting pressures up to 55,000 psi; (d) a speed reducer and motor drive assembly.

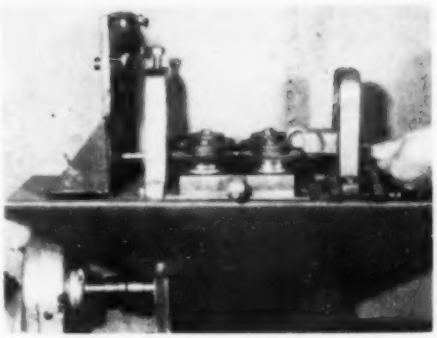
The purpose of the seam leveler is: to refine the grain structure; minimize stress concentrations by avoiding a change in cross-section at the weld; improve the appearance of the parts; and increase both tensile strength and elongation of the parts.

It may not be clear to some how it is possible to obtain an increase in tensile strength concurrently with an improvement in ductility as a result of weld-leveling operation. This is explained as follows: In rolling the weld seam under high pressure, the large dendritic grains of the weld structure are broken up or deformed. The material becomes work-hardened. As might be expected, the tensile strength of the weld is increased.

Eliminates Stress Concentrations

Because the leveling operation eliminates the notch effect which occurs as a result of "sag through" of the penetration, stress concentrations at the edge of the weld are eliminated. This, of course, causes the load to be more evenly distributed, resulting in lower unit loading in the weld area.

The seam-leveling machine increases tensile strength by 14% and elongation by 11%—a significant improvement in mechanical properties. These figures are average for 321 stainless steel. The improvement in physical properties, however, is not confined to stainless. Tests on mild and low-alloy steels, nickel alloys such as Inconel, iron-base alloys such as *N*-155, and cobalt-base alloys such as *L*-605 have shown that in every case the weld-leveling operation improves both the tensile and the elongation properties of the metal.



TUBE WELDING MACHINE was developed by Solar to overcome the difficulty of obtaining comparatively small quantities of tubing in special sizes and of special alloys (welding head not shown). Machine can attain a welding speed, depending on wall thickness, of up to 60 ipm

Automatic Contour-Welding Machine

Automatic contour welding is used on the variable nozzle, a portion of the afterburner for *GE's J47* engine. As contours in jet-engine parts usually are slight compared to exhaust manifolds, our standard Solar buttwelders were easily adapted for this purpose. With the same special contour on the backup bar and hold-down dogs, parts are run in production without the need of elaborate electronic control devices for contour-welding jobs.

Our present production is confined to a 1-in. deflection in 6 in., this being the greatest contour of the several parts currently in production. Setting the piece to an average position, the deflection due to contour can be reduced to ½ in. Operators easily can maintain the arc gap by hand manipulation of the conveniently located arc-length adjustment wheel. As with the standard buttwelders, simplicity of operation has been stressed in this equipment.

Tube Welding Machine

Many high-temperature aircraft parts require tubing special as to size and alloy. This is especially true in the design, mock-up, and experimental stages of development. Many of the alloys required are not known to the tube manufacturers. Methods of processing must be developed but quantity requirements are small. This makes it an unprofitable endeavor for the tube manufacturer and results in long and uncertain delivery dates. To overcome this difficulty Solar developed a special tube welder.

This machine welds preformed tubes of random lengths. Tubes are fed through the drive rollers and pass beneath the stationary welding head (not shown). The range of tube sizes for this machine is ⅜ to 1¼ in. in diameter. On these small diameters copper backup bars are impractical. Helium is the shielding gas. Welding speed, depending on weld thickness, is up to 60 ipm.

Inert-Gas Shielded Arc Circumferential Welders

The Solar inert-gas shielded arc circumferential welders employ a stationary welding head, an ingenious wire-feed device, and essentially the same electrical control system as the longitudinal buttwelders. The torch is held stationary and the part revolves beneath it. This appears to be the most satisfactory method of application on light materials. A 1/16-in.-dia filler rod is fed mechanically at one inch of rod per inch of weld.

Wide application of this type of weld on jet engines looks encouraging. Currently in process is a tailpipe which will be assembled by three 102-in. circumferential buttwelds and three 100-in. longitudinal buttwelds. One problem is that these machines are not universal as regards diameters that can be welded, so holding fixtures must be specialized. Backup bars must fit so close that a 1-in. change in diameter on fairly large parts

requires construction of another fixture. Welding heads and drive motors can be made interchangeable. Time saved in welding will more than offset costs of tooling. Uniformity of the weld is, of course, a major factor.

Tooling for this type of weld can be very simple. A split circular backup bar is the main requirement. Pushing the bar outward to apply pressure against the part to be welded and two end clamps to prevent the parts from splitting is all that is necessary. No external clamp rings are used. Also, tack welding is unnecessary and is actually detrimental to the operation.

Use of 1/16-in. filler rod eliminates the necessity of having a perfect butt fit. Parts shown are formed in two halves and then hand-trimmed. Gaps up to 1/16 in. can be welded very easily with no extra operations or change in the appearance of the weld. When welding an area containing a gap, the operator merely reduces the welding current with a foot rheostat. Welds by this method can be controlled to an extremely high degree of uniformity in all cases.

Shielded Inert-Gas Metal Arc Welders

Research and development on one of the first sigma welding machines manufactured has been carried out by our Welding Engineering Group in conjunction with our Bellows Division (*AM*—Aug 18, '52, p 109). Advantages of this method are: (a) High-speed welding is possible. (b) Welding is completely automatic. (c) Welds of highest quality are consistently produced. (d) The weld puddle can be observed and controlled.

Applications of Sigma Welding

The process works to greatest advantage where a vertical flange is welded in a vertical position. To date usage has been confined to fillet welding but numerous butt-weld applications are under development. The size of fillet can be controlled by the operator. Heat is the only manual control on the machine. Arc gap, travel of rod, and automatic start are all controlled electronically. Electrical breakdowns average the same as for other similar equipment.

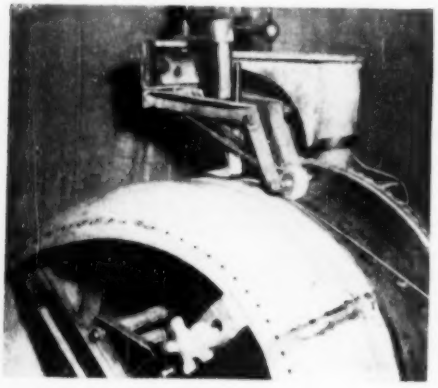
Theory of the process is to spray enough metal at the weld area fast enough to constitute a weld fillet. Size of fillet is governed by the speed of travel. To insure a constant spray of metal on stainless steel, a mixture of argon and oxygen is used as the shielding gas. If pure argon or helium were employed, the rod would burn off in the form of globules. Mixing a quantity of oxygen with the argon tends to break up these globules, causing the metal to spray. Outwardly welds appear burned. Actually, they are not affected by the oxygen in the shield and are as clean, sound, and strong as welds produced by comparable methods.

On our industrial bellows, 10-ft-dia spans with 33-ft seams have been welded in 12 min., saving many hours of hand welding. Rate of welding averages around 70 ipm. Rod is fed in at a rate of 100 to 380 ipm, depending on the size of the rod selected. The intense heat required to spray this amount of metal makes this a very fast welding process. All production welds are confined, therefore, to welds in relatively heavy cross-sections. A typical application is to join an 0.063.-in.-thick stainless steel span to a ½-in.-wall low-alloy pipe. This job would be impossible without burn-through unless adequate copper chill bars were employed. In this type of weld, no through penetration is acceptable.

Tooling for the method is universal. One turntable handles many hundreds of different-diameter parts without modification and only slight speed adjustments. The best construction for the turntable is to mount two roller pin type shafts to a drive motor, one pin driving and one idling. In this manner, speed of travel can be varied independently and is not a function of the diameter of the pipe.

Submerged-Arc Welding Machines

Submerged-arc welding probably is the fastest and gives the least amount of trouble of all automatic welding. Inert-arc processes sometimes produce a very porous weld on mild- and low-alloy steels because of dissolved gas. Where heavy-gage low-alloy pipes are to



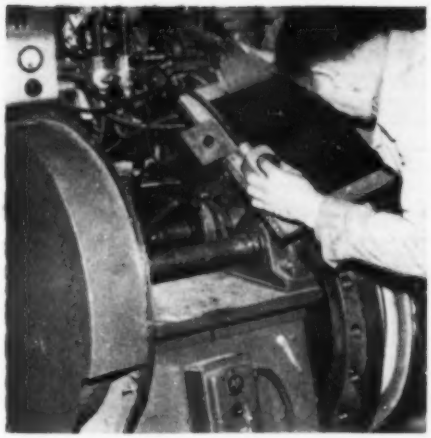
AUTOMATIC CIRCUMFERENTIAL BUTTWELDER is a unique adaptation of fundamental principles to a specific welding problem. Designed and built by Solar, welder employs an inert shielded-arc torch held stationary while the work revolves beneath it. Machine produces 92 in. weld in jet-engine component made of Inconel W in less than 7 min. By manual welding methods job required 45 min. Complete cycle time (loading, fitting, welding, and unloading) was cut from one hr to 23 min.

be joined, the submerged-arc process does an outstanding job both for appearance, strength, and weld quality. The process also is applied to stainless and high-alloy fabrications. A J47 burner plate and four other large welds are currently being made at Solar on stainless steel and mild steel parts by this process. Welds are run daily with very little repair. At Solar the application of submerged-arc welding is limited to fillet welding on relatively heavy sections (0.125 in. minimum thickness).

Most submerged-arc welds are flat because of the difficulty of holding the flux. Circumferential welding around a pipe is successful provided the diameter is not too small to hold the flux. Unlike sigma welding, more precise jigs must be built when welding high-alloy materials. Because welding is accomplished under a blanket of granular flux, eye protection for the operator usually is unnecessary. Because of this characteristic, however, once the operation begins, the operator has little control over it. Weld fillet size and pattern must be predetermined by experiment.

Shielding and Backup Materials

For routine inert-arc machine welding, helium gas will produce a superior product. For manual welding, argon usually is preferred. This is because: (a) The rate of heat transfer across the helium-shielded arc is significantly greater than that across the argon-shielded arc. To the welder this means that the helium-shielded arc is "too hot to handle." This feature, which makes the helium-shielded arc undesirable for manual operations, enhances its value for machine welding as conditions in machine welding are highly standardized. (b) The weld puddle and the solidified weld metal are noticeably cleaner with the helium-shielded arc. This is especially apparent when welding thin materials. Nitrogen has been used experimentally as the shielding gas. To date results have not been encouraging. Difficulties are caused primarily by impurities and water vapor in the gas. While this is not an insurmountable difficulty, nitrogen is an embrittling agent in steels. Nitrogen as a shielding gas therefore must be carefully scrutinized before it is accepted as an adequate medium.

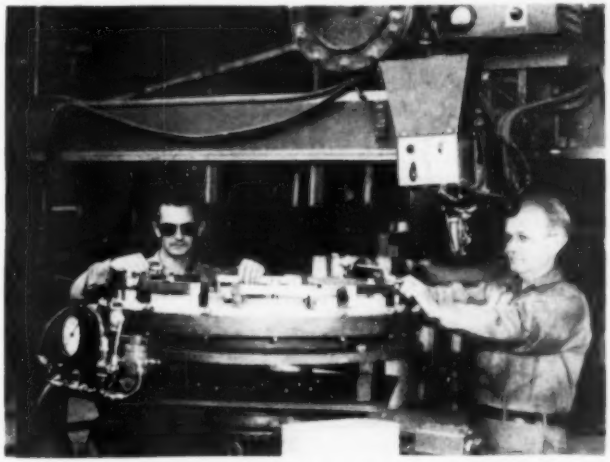


TOOLING for the sigma welder, one of several in operation at Solar, is universal. This turn-table designed by Solar handles hundreds of different-diameter parts without modification and with only slight adjustments in speed. Major advantages of this process include great speed, completely automatic welding, high-quality output, and ability of operator to see and control weld puddle

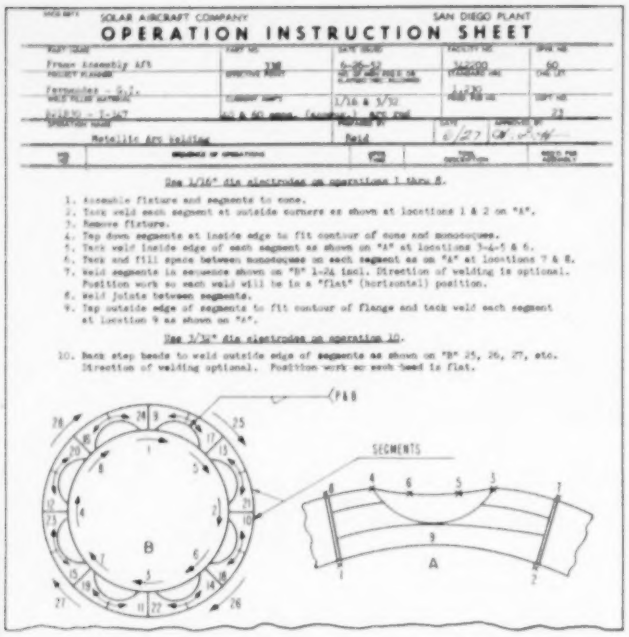
It is generally accepted that some sort of backup means must be employed when welding high-alloy materials. This may be a metal mandrel, a shielding gas, or a good welding flux. Where the job does not justify precision tooling with copper backup bars and adequate clamping, Solar Back-Up Flux may be employed to good advantage. (*AM*—Aug 18 '52, p109). Through the application of this flux, stainless steel behaves much like copper as regards heat conductivity.

Process Control

In view of the numerous types of fusion-welding applications at Solar, stringent process control is imperative for highest quality welding. To insure uniformity, a group of technicians and welding engineers, operating as a separate department, coordinate all phases of welding with the Production, Quality Control, Research, and Engineering. The purpose of this group is the development and ap-



SUBMERGED-ARC WELDING probably is the fastest and least troublesome of all the automatic processes. At Solar, the process usually is employed for fillet-welding on relatively heavy sections (0.125 in. minimum thickness). Setup is for a J47 burner plate



SOLAR AIRCRAFT COMPANY — SAN DIEGO PLANT

OPERATION INSTRUCTION SHEET

Metallic Arc Welding — Weld

Use 1/16" dia electrodes on operations 1 thru 8.

1. Assemble fixture and segments to cone.
2. Tack weld each segment at outside corners as shown at locations 1 & 2 on "A".
3. Remove fixture.
4. Tap down segments at inside edge to fit contour of cone and monocoques.
5. Tack weld inside edge of each segment as shown on "A" at locations 3-4-5 & 6.
6. Tack and fill space between monocoques on each segment as on "A" at locations 7 & 8.
7. Weld segments in sequence shown on "B" 1-24 incl. Direction of welding is optional. Position work so each weld will be in a "flat" (horizontal) position.
8. Weld joints between segments.
9. Tap outside edge of segments to fit contour of flange and tack weld each segment at location 9 as shown on "A".

Use 3/32" dia electrodes on operation 10.

10. Back step beads to weld outside edge of segments as shown on "B" 25, 26, 27, etc. Direction of welding optional. Position work so each bead is flat.

SEGMENTS

OPERATION INSTRUCTION SHEET tells operator exactly how to do job. Procedure is written by the Welding Engineering Group. Quality Control group checks work as it is being done to make sure correct procedure is followed. Close process control is necessary to maintain high quality in welding difficult alloys specified for jet engine applications

plication of welding controls in the plant.

Functionally, this group performs day-to-day servicing and surveillance at all welding stations. New welders are trained on new jobs. All welding equipment and machines are checked and operated. Through close floor observation the group keeps performance in line with quality standards for design, operational sequence, welding technique, and experimental welding procedures.

Weld Testing Method

Basic requirements for welds on aircraft engines are that they be strong, smooth, and consistent. Air Force specifications require that welds be 85% as strong as the parent material. Solar's Quality Control Division requires welds to exceed this specification and be equal in both strength and ductility to the parent material.

The most effective medium that has been found to date for testing welds is the Erickson Standard Cup Test. A cup test consists of clamping the material, deforming it with a ball, and stretching the metal until it breaks. The weld is placed in line with the center of the ball. If the parent material breaks first, the weld is considered good. If the weld breaks first, the welding schedule is checked to determine the cause of failure and the necessary corrective action.

All welding, whether manual or machine, is controlled by the Operation Instruction Sheet. This form, which is established and maintained by the Welding Engineering Group, represents the link between this group and the Quality Control Division. The form contains all of the information necessary to do the required operation. The responsibility for checking the operation to ascertain conformance with the chart lies with the Quality Control Division.

Manual vs Machine Welding

Machine welding is not a matter of pushing a button that causes one part or several hundred parts to be welded. Although many hours of actual welding time may be eliminated by machine welding, hundreds of hours may be required for research and development on the adaptation and utilization of the process.

Selection of mechanical welding is based largely on economics. Each application must be studied to determine if the development and tooling costs can be amortized over the contemplated production run. For example: A current contract on J47 components calls for 1500 units involving 11 ft of welding per unit. Studies show that 5500 ft of mechanized welding (500 pieces) are required to pay for tooling and equipment. The remaining 11,000 ft of welding will be acomplished at a cost ratio of 1 to 5 over manual welding. An intangible that is difficult to evaluate lies in the dollars and cents value of the superior quality that results from mechanized welding.

Effect of Weld Thickness

That machine welding produces superior quality products cannot be denied. An important factor in insuring long service life in high-temperature aircraft components lies in the thickness of the weld bead. Because of operating temperatures, the welds must expand and contract at the same rate as the parent material. Manual welds will normally be 40 to 50% thicker than the parent material. This causes stress concentrations because of (a) change in cross-sectional area and (b) temperature gradients through the weld seam.

Automatic or machine welding produces about a 5% increase in material thickness, thus eliminating the design difficulties noted above. The weld leveling machine previously discussed further reduces the 5% increase in thickness and also increases tensile strength by an average of 14% and elongation by an average of 11%. The net result is that thermal expansion can be calculated accurately and considered in design.

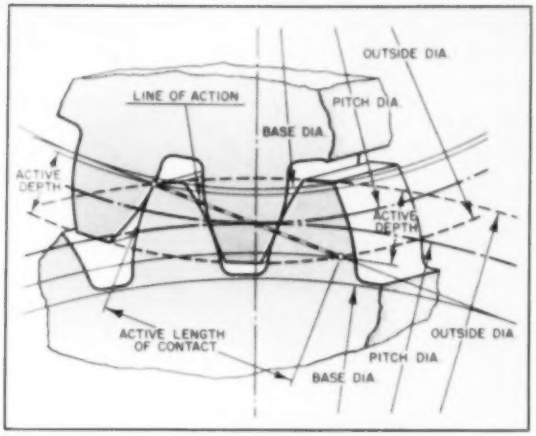


Fig 1 — *Master gears must check production gears over the entire active portion of the involute*

HOW TO DESIGN AND APPLY MASTER GEARS

Master gears are the "policemen" of the gear-checking process — they catch the violators among production gears. Here is an explanation of master-gear requirements and proper application

By FRED BOHLE
Manager, Machine Division
ILLINOIS TOOL WORKS, Chicago

Historically, master gears were the first method of gear checking; today, master gears and rolling fixtures are still the policemen of the process. They are the basic gaging element in functional gear checking, the practice of testing gears by the way they roll or function.

In functional gear checking, the gear to be checked is rotated with the master gear in intimate metal-to-metal contact. If involute profile, tooth spacing, helical lead and concentricity are perfect in both master and gear, the two will roll together with no variations in center distance. If errors are present in any of their elements, variations in center distance will occur and size and runout errors will be reflected at their true value. Involute profile, tooth spacing, and helical lead errors will also be indicated at a distorted but magnified ratio, depending upon the pressure angle. Errors in the master gear itself, regardless of their nature, confuse the accuracy picture of the gear and subtract from the manufacturing tolerances.

Inaccuracies in the master gear are very costly in production. In all probability, the rolling check has been assigned a tolerance for indicator variation. Errors in the master contribute to this indicator movement, thus leave a smaller tolerance for the production processes. They keep operators from getting identical results on successive checks. In the way these master-gear errors increase or cancel those of the production gears, they may cause a good gear to be rejected or a bad one to be accepted. *Great accuracy is therefore the most important characteristic of master gears.*

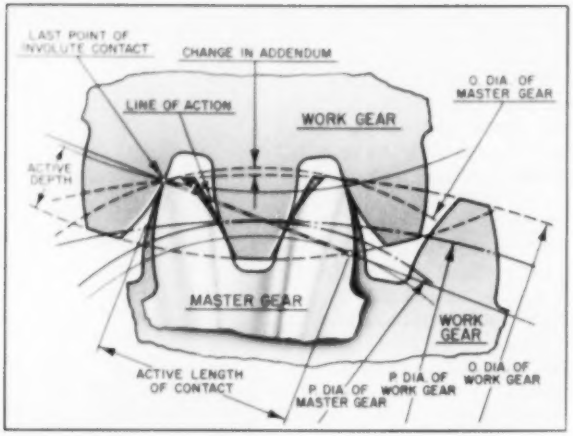


Fig 2 — *Addendum of the master may be unlike that of the work gear, yet contact over the same area*

These are the other important characteristics:

They should check production gears over the entire active portion of the involute (Fig. 1).

Their exact size should be known for center-distance checking.

Their design in general should help to produce and retain the highest degree of accuracy.

The term "master" may be misleading to many people because it implies that the master gear is a duplicate of the production gear. Some parts, cams for instance, whose proportions are difficult to express in simple, measurable dimensions, are frequently checked and compared against masters of identical size. A master gear, however, need not be like the gear it represents. As a matter of fact, good master gears seldom are true duplicates of their representative production gears.

Size and design of a master gear have to fulfill the basic requirements of checking a certain production gear over its entire width and to the full active depth of its involute. In the past, and to quite an extent today, this design problem was simply solved by making the master gear exactly like the mating gear but slightly wider on its face. This practice is entirely justified whenever general proportions of the mating gear are also ideal for the master. It should definitely not be followed when it leads to sizes and number of teeth which do not insure maximum accuracy and minimum cost in production of the master gear.

Calculation of the active involute profile and the last point of contact with the mating gear is very simple for those familiar with gear geometry. It is equally easy to determine the addendum of a master gear which may not be like that of the gear and yet contacts over the same area (Fig. 2). Complete data on both mating gears are required, however, for proper design of a master.

One other design consideration is strictly in the interest of *continued* accuracy of the master. The portion of the involute near the base diameter is most difficult to hold accurate and most subject to wear. Therefore, the ideal master gear should be designed, if possible, to avoid any contact below approximately 5° PA (Fig. 3).

In addition to correct gear-design requirements, the relative proportions of diameter, face width, and hole size are just as important on master gears as they would be on any other part which

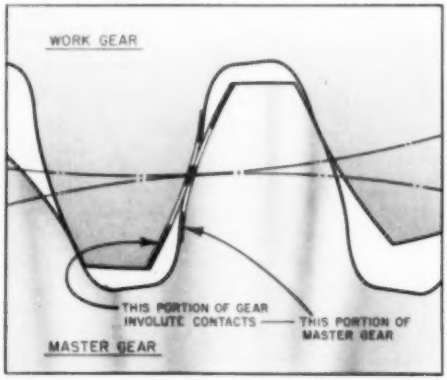


Fig 3 — *The portion of the involute near the base diameter is most difficult to hold accurate and most subject to wear. Therefore, the master gear should be designed, if possible, to avoid contact below about 5° PA*

TABLE 1 – STANDARD MASTER GEARS

A — 20° PA

DP	HOLE	FACE	NUMBER OF TEETH	PD	RANGE
3	1 3/4	2	30	6 2/3	35
4	1 3/4	1 3/4	20	5	45
6	1 1/4	1 1/2	24	4	55
8	1 1/4	1 1/4	30	3 3/4	70
10	1 1/4	1 1/8	30	3	90
12	3/4	1	36	3	110
16	3/4	7/8	36	2 1/4	120
20	1/2	3/4	40	2	120
24	1/2	5/8	42	1 3/4	180

B — 14½° PA

DP	HOLE	FACE	NUMBER OF TEETH	PD	RANGE
3	1 3/4	2	20	8	–
4	1 3/4	1 3/4	24	7	–
6	1 3/4	1 1/2	30	6	44
8	1 1/4	1 1/4	36	5	50
10	1 1/4	1 1/8	40	4	65
12	1 1/4	1	42	3 1/2	80
16	3/4	7/8	48	3	90
20	3/4	3/4	50	2 1/2	100
24	3/4	5/8	48	2	150

is to be highly accurate and is to retain that accuracy over a long time. Master gears depend for location upon their holes and faces, and these should be proportioned to insure continued accuracy.

The foregoing rules might imply that all master gears should be designed for one specific gear only. Table 1-A, however, shows suggested standard sizes for 20°-PA gears. Masters made to these specifications meet all criticism for minimum size. At the same time they are large enough not to be contacted below 5° PA by any gear whose teeth fall within the "range" column of the table.

Theoretically, of course, the OD or addenda of master gears can only be designed for one specific gear. Other gears of the same basic data, however, may be checked by the same master. In such cases, contact will extend slightly beyond or short of the active depth. The change is very gradual but may, in some cases, necessitate grinding the OD of the master.

If the PA of the gears is smaller than 20°, the number of teeth in the master should be increased. Table 1-B indicates the ideal sizes for master gears of 14½° PA.

With the exception of some instrument gears, all gears are made with backlash. Therefore, in metal-to-metal contact with a gear of standard tooth thickness, they will roll at reduced center distance; in other words, all production gears are undersize gears. In those instances where the functional or rolling check is also a check of the gear, a calculation of the reduction in center distance must be made.

It is fairly common practice to approximate this correction by applying the following formula:

$$\text{CD Correction} = \frac{\text{Backlash}}{2 \times \tan \text{PA}}$$

Backlash is to be taken as a reduction in circular tooth thickness at the pitch line.

Actually, undersize or oversize gears establish rolling diameters other than the nominal pitch diameters. The exact size of these rolling circles not only depends on the amount of undersize but also varies with the number of teeth of the gear. The theoretically correct way of establishing center distance is shown in Fig. 4.

The amount of backlash varies not only with the pitch but also with the specific use of the gears, and no standard figures for the reduction in center distance can be established. Under average conditions, the reduction in tooth thickness for, say, a 6-DP, 14½°-PA gear is approximately 0.003. If the gear has 28 teeth and is to be checked by a master of 24 teeth and of exactly standard circular tooth thickness, the center-distance correction by the exact formula would be 0.0061, while the correction by the approximate formula would be 0.0058. Such a small deviation is immaterial under most circumstances.

It is important to realize that any master having the same number of teeth as the mating gear, but with standard tooth thickness and addendum, will roll at reduced center distance and contact the gear beyond the last point of contact with its real mate unless its addenda are corrected.

Basically, there are two methods of grinding master gears: by generating, and by form grinding (Fig. 5). The generating method will produce correct involutes regardless of size. In the case of

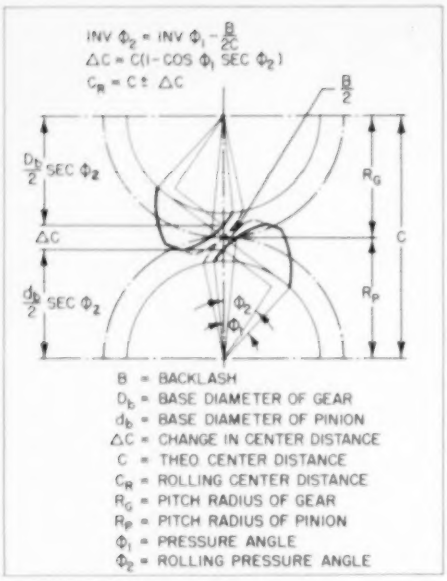


Fig 4 — *This is the theoretically correct way of establishing center distance*

form grinding, however, the shape is dressed on the grinding wheel and is only correct for one specific position of the grinding wheel. Therefore, size of a form-ground master gear must be held very closely or involute errors will result.

Some gear manufacturers specify overly close tolerances for their masters. The usual tolerance on wire reading is ±0.0005. Such a close tolerance works a considerable hardship upon the manufacturers of masters because it becomes necessary to have all other tolerances under control when size is reached. If any one element should be outside its tolerance, it is impossible to regrind without going undersize. However, even a tolerance of ±0.0005 leads to size variations which are totally unnecessary. It is far better to know *exactly* what the size of each master is and use that figure for the center-distance setting. The calculation is one of mere addition or subtraction. When the OD of the master is ground to contact the full active involute, greater uniformity and better control are obtained than when using masters of standard proportions with tolerances of ±0.0005.

Most master gears are ground by the generating method. The real gain in using a generated master gear and not specifying a close size tolerance is in the over-all accuracy of the master gear. Even with a +0.005−0.000 tolerance on wire reading, master gears are very accurate as far as size is concerned, because the *exact tooth thickness* can be measured and etched upon the gear. This tooth-thickness figure is taken into the calculation of the center-distance correction in a very simple way:

The nominal center distance, of course, is

$$\frac{PD_{gear} + PD_{master}}{2}$$

The amount of correction depends upon the actual tooth thickness of both the gear and the master. As previously mentioned, all gears have less than standard tooth thickness to provide backlash. The tooth thickness of the master is usually (but not necessarily) slightly greater than standard and is etched upon the master.

Through the use of a graph like that shown in Fig. 6, this correction becomes one of mere subtraction from the nominal center distance. In Fig. 6, the horizontal scale indicates the difference of the sum of both circular tooth thicknesses from the circular pitch, that is:

$$\text{Circ Pitch} - \text{circ TT}_{gear} + \text{circ TT}_{master}$$

The vertical scale indicates the center-distance correction. For example, take a work gear with 80 teeth, 10 DP, 8-in. PD, 14½° PA, and actual tooth thickness of 0.1552 in. rolling with a master of the following characteristics: 40 teeth, 10 DP, 4-in. PD, 14½° PA, and etched circular tooth thickness of 0.1585 in.

$$\text{Circular Pitch} = \frac{\pi}{DP} = \frac{\pi}{10} = 0.3142$$

$$\text{Vertical Scale} = 0.3142 - (0.1552 + 0.1585)$$
$$= 0.3142 - 0.3137$$
$$= 0.0005$$

For 14½° PA, Fig. 6 indicates a center-distance correction of 0.001.

It is entirely possible, particularly in the coarser pitches where the backlash may be great, that the difference between the circular pitch and the sum of circular tooth thicknesses will exceed the values shown on the vertical scale. In such instances, it is permissible to divide the difference by the nominal center distance, spot the value on the vertical scale of Fig. 6, follow it up to the PA line, read the center-distance correction and multiply that correction again by the nominal center distance. For example: Take a work gear with 32 teeth, 4 DP, 8-in. PD, 20° PA, and actual circular tooth thickness of 0.3827, rolling with a master of the following data: 20 teeth, 4 DP, 4-in. PD, 20° PA, and etched circular tooth thickness of 0.3939.

$$\text{Circular Pitch} = \frac{\pi}{4} = 0.7854$$

Sum of circular tooth thickness of gear and master

$$= 0.3827 + 0.3939 = 0.7766$$

Difference = 0.7854 − 0.7766 = 0.0088

Nominal center distance

$$= PD_{gear} + PD_{master} = \frac{8+5}{2} = 6.500$$

$$\frac{0.0088}{6.500} = 0.0014$$

Center-distance correction (from Fig. 6) = 0.002

Total CD correction: 0.002 x 6.5 = 0.013.

Naturally, Fig. 6 may also be used for the reverse process of determining the tooth thickness of the work gear from the measured center distance. The formula is

Circular TT_{gear}

$= \text{Circ Pitch} - \text{Circ } TT_{master} + \text{Difference}_{Fig.\ 6}$

For example: If in the previous example, the actual center distance between master and work gear had been found to be 6.487, then the center-distance correction would be:

nominal center distance − actual center distance

or

$$6.500 - 6.487 = 0.013$$

As 0.013 is outside the range of Fig. 6, divide by the nominal center distance:

$$\frac{0.013}{6.500} = 0.002$$

For a value of 0.002 on the horizontal scale and 20° PA, Fig. 6 gives a total tooth-thickness difference from circular pitch of 0.0014

Actual difference is 0.0014x6.500 = 0.0088

Circ TT_{gear} = circ pitch − (circ TT_{master} + actual diff)

Circ TT_{gear} = 0.7854 − (0.3939 + 0.0088)

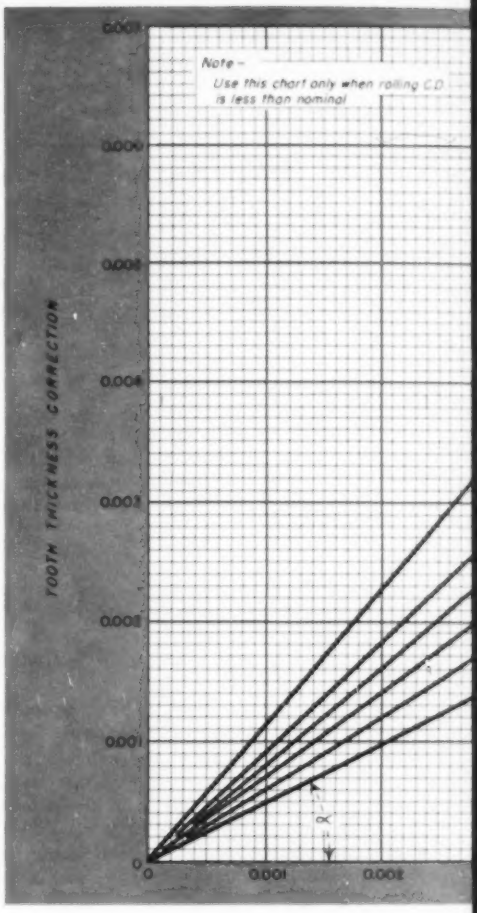
Circ TT_{gear} = 0.7854 − 0.4027

Circ TT_{gear} = 0.3827

Fig. 6 shows only the lines of the most popular pressure angles. Other PA lines may be entered by making their slope,

$$\text{Tan.}\alpha = \left(\frac{1.83 + PA^{\circ}}{200}\right) \text{Tan. PA}$$

Such additional pressure-angle lines will be particularly useful for helical gears because the



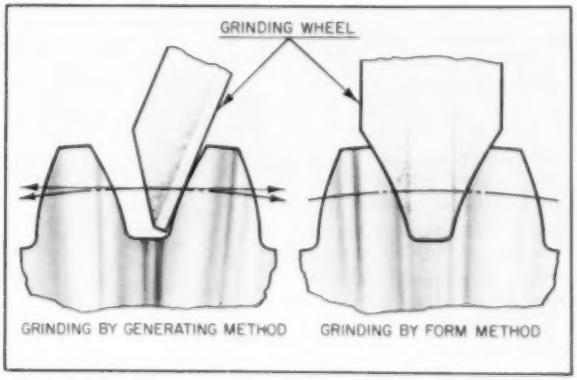


Fig 5 — *Master gears can be ground either by generating or by form grinding*

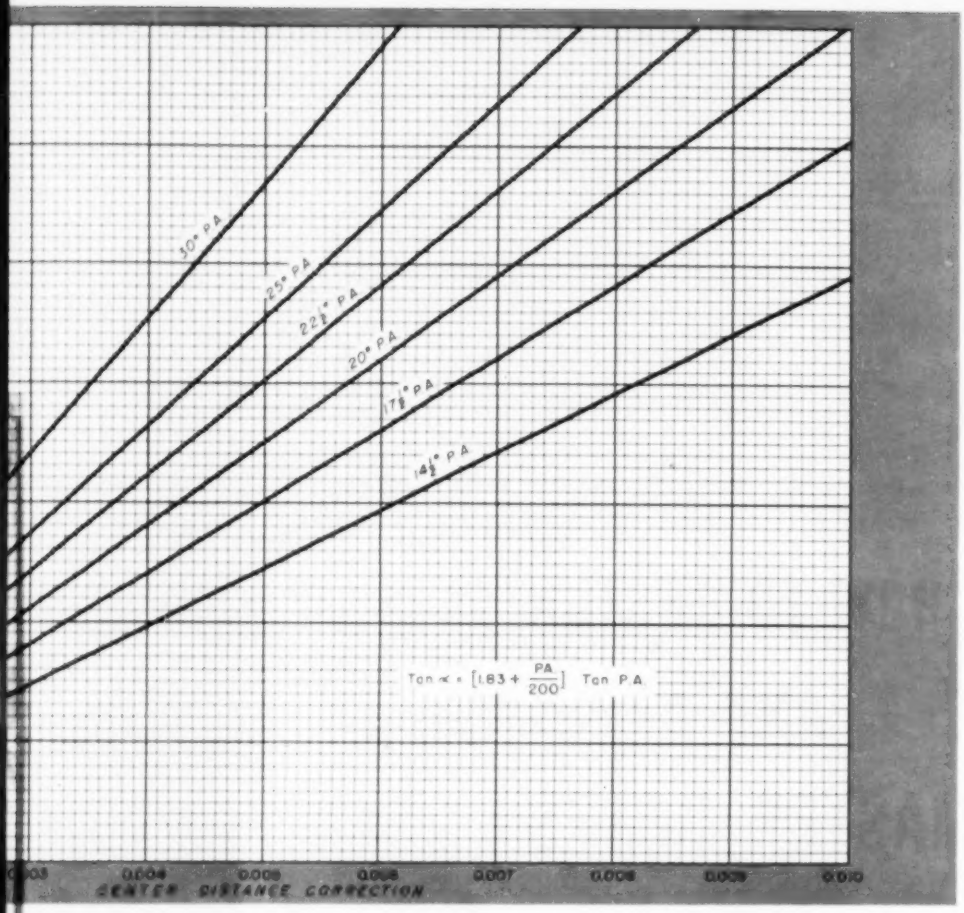


Fig 6 — *With this graph, correction for tooth thickness of the master gear becomes merely subtraction from the nominal center distance*

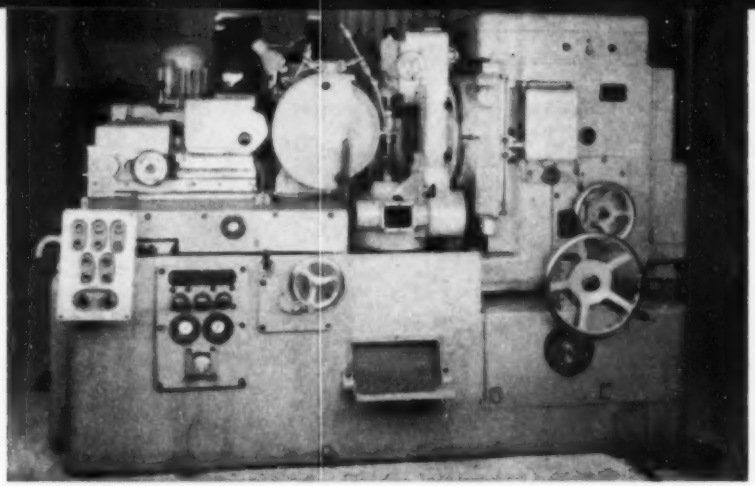
transverse PA must be used in calculating center-distance corrections or tooth thicknesses. The circular tooth thickness which is marked on a helical master gear is in the transverse plane.

All good master gears are subjected to a series of treatments designed to minimize any subsequent distortions in service. It should be remembered, however, that all gears, when rolling together, are subject to some wear. Therefore, master gears should be inspected from time to time. Regrinding is rarely advisable because the cost is almost equal to that of a new gear. Besides, it is usually the reference surfaces, that is, hole and faces, which are most subject to wear.

Master gears are expensive gaging elements. Their original cost, however, is small compared to the expense they may save if properly designed and accurately made.

SUMMARY

The over-all design of master gears, their size and size-tolerances, should all help to produce the maximum possible accuracy. Masters should check gears over the entire active portion of their involutes. In the interest of continued accuracy and long life, a master gear's design should avoid contact near its base circle. A master gear's size should be known. The circular tooth thickness at the nominal pitch diameter is used for accurate center-distance calculations. Master gears should be heat-treated to minimize subsequent distortion. Nevertheless, they should be checked from time to time for the effects of wear and abuse. **Remember, inaccuracies in a master are costly.**



SOVIET HELICAL GEAR GRINDER is said to have higher production than standard grinders. Continuous spiral on wheel face has the form of a rack profile, the work gear being rotated in worm-drive fashion. Wheelhead is horizontal, and workhead moves upward, tangent to wheel, to bring work gradually to the point of maximum cut. For helical gears, workhead may be swiveled 45° either side. Machine will handle gears from ⅛ to 4¼ in. in dia, and with 20 to 360 teeth. Small gears can be cut from the solid. Wheels are from 15 to 18 in. in dia, and run at 1500 rpm. Crush dressing is used.

Iron Curtain Lifts to Reveal.... RUSSIAN MACHINE TOOLS

Although Russia has been a heavy importer of European machine tools, there is ample evidence of a strong domestic industry and some original thinking by her engineers. Here are some interesting examples from USSR, East Germany, and Red China

FROM the quantity and quality of Russian war materiel, it has long been evident that there must exist a fairly substantial Soviet machine tool industry but, for the most part, its products have remained hidden from Western eyes. Now, for perhaps the first time, a small corner of the Iron Curtain has been lifted and we are permitted to appraise some of the equipment exhibited at the recent Leipzig Fair. Exhibits included machines produced by the USSR, East Germany, and—quite a surprise—China.

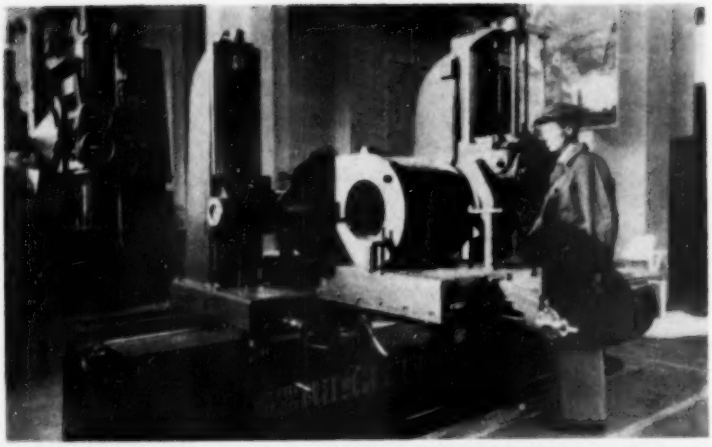
Indications are that the USSR is now turning out well over 100,000 machines a year and, although Russian practice is to standardize designs—to make only one model of each specific type, be it lathe, drillpress, or grinder—the diversity of the machine tools seems to be increasing with their number. Greater emphasis is certainly being placed on automatic and specialized models. Such a policy is entirely practicable because the complete standardization of product in the metalworking industries permits single-purpose, high-production machines to be operated at full capacity.

It is evident, also, that the Russians are contemplating invading non-Communist markets, as much of the descriptive literature was prepared in English. India and Pakistan will probably offer the first markets, as well as other eastern countries where English is spoken by most educated people.

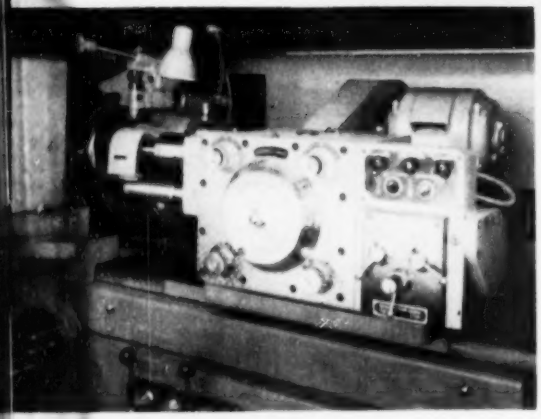
East German machines are, of course, still being produced by the old-established, prewar builders, but most of them have been nationalized into a State corporation, *Werkzeugmaschinen und Werkzeug* (*WMW*), and the old names of Niles, Wanderer, and Magdeburg are not found on the later models. It was noticeable that WMW machines were uniformly painted green and occupied the center of the floor. The few companies still privately owned had their machines painted gray and were relegated to the edges. East German exports are mainly to the eastern *bloc*, with emphasis on Communist China, where an exhibit is to be held next year.

Chinese-built machines were displayed in a separate hall and, although they were prototypes and not for sale, it is significant that China does have a machine-tool industry. Most of the machines had been made in China for the first time this year, but designs appeared to be 10, 15, or more years old. Construction was adequate and, although finish varied considerably between different machines, all showed that plenty of attention had been paid to the precision of working parts.

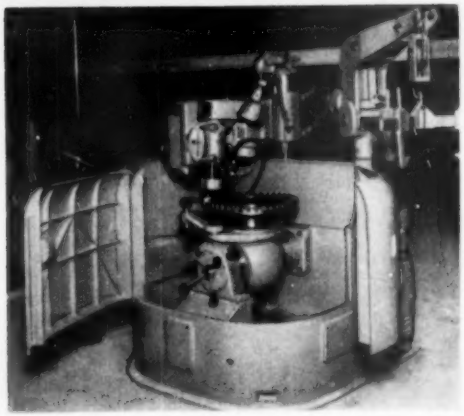
Exhibits included a double-column, vertical boring mill with a 78-in. table, a horizontal boring machine with a 33-in. max. spindle elevation, a vertical slotter, a gear hobber, universal mill, and several lathes and grinders. *(Please turn page)*



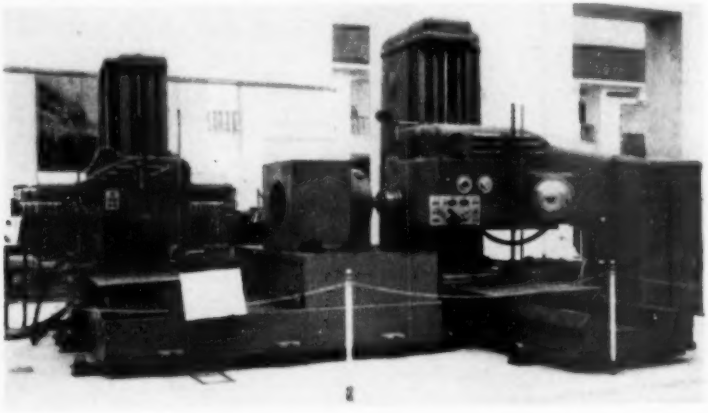
CHINESE HORIZONTAL BORING MACHINE, made in Shanghai, has 3-in. dia spindle with 33½-in. vertical traverse. Max. distance from facing slide to end support is 75 in. 18 spindle speeds range from 16 to 737 rpm, and automatic transverse movement of the 57 × 25-in. table is 39 in. All Vee and flat ways were obviously hand scraped



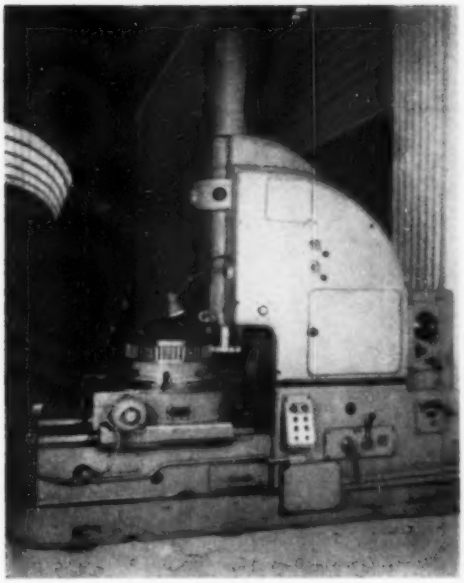
AUTOMATIC, INTERNAL, centerless grinder with magazine loading made in USSR. Work from 2¼- to 7⅞-in. OD (2⅝- to 7¼-in. ID) is driven between control, support, and pressure wheels. Workhead can be swiveled for taper grinding to 60° incl angle. Length of bore is 4 in. max. Cycle is: rough grind, diamond dress, finish grind, eject



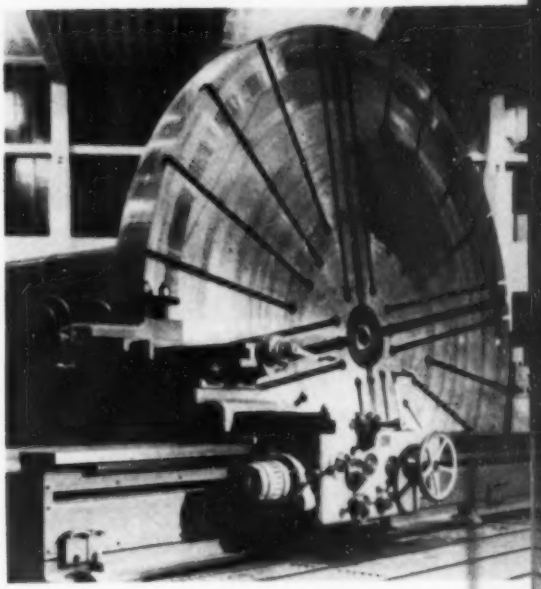
LARGE-DIA MILLING CUTTERS can be sharpened on this East German, automatic grinder which can handle work to 28 in. Workhead spindle and support (housing the driving motor) can be tilted 90° forward, 45° back, while grinding head swivels 15° in either direction. A built-in crane is provided for handling heavy cutters



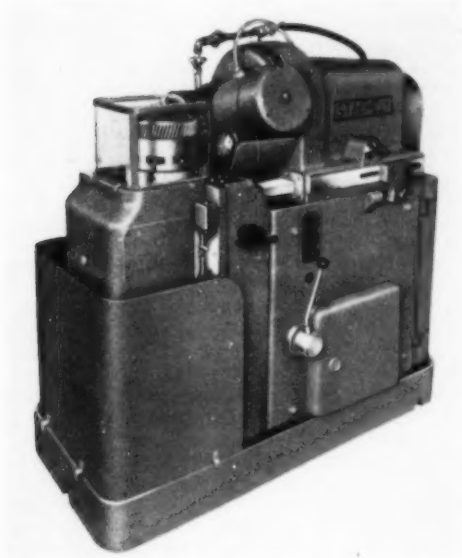
RUSSIAN-BUILT, HORIZONTAL boring, drilling, and milling machine has 5-in. spindle, 47-in. max. spindle height, and 126-in. cross travel of spindle column. Max. dia and depth of bore is 35 in. 24 spindle speeds run from 7.5 to 1500 rpm. Outer support bushing is mounted on separate bedplate and has electric elevation. Push-button controls are employed throughout



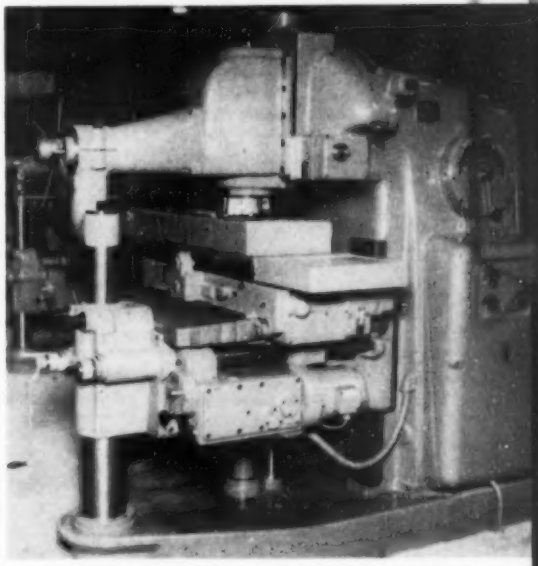
RUSSIAN-BUILT GEAR GENERATOR weighs 9 tons and looks like a vertical slotter. It can handle gears up to 31 in. in dia. Circular cutter operates at 25 to 160 strokes per min, and worktable turns at 3.6 rpm



EAST GERMAN T-LATHE has 14¼-ft faceplate, and tailstock some 30 ft off to right. Slide beam can be bolted in any position along T-slotted sectional bed. This is largest model, weighing 50 tons; smallest has 4½-ft swing and is 5 ft from faceplate to tailstock



MADE BY STAEHELY, Gelenau, East Germany, this gear hobber has a stationary hob head and vertical work-carrier traverse. Greater strength and rigidity is claimed, plus simpler construction and faster cutting with large-dia hobs. Gears from 1½ to 15¾ in. can be handled, with up to 45° helix. Machine was shown cutting a 7-in.-dia 52-tooth gear in 8 min, using a 9½-in. hob



EAST GERMAN VERTICAL MILL of unusual design. Table is 14 × 49 in. and has automatic traverse in three directions: longitudinal 33½ in. cross 9⅞ in. and vertical 16½ in. Height of swiveling head is adjustable. Machine is made in three table sizes with appropriate traverses, and is manufactured at the Wanderer works, now a part of the nationalized WMW

SAFETY COMMITTEE MEETINGS (one for each plant) plan steps to be taken to eliminate unsafe conditions and promote safety consciousness. Goggle display is one of three circulating through the plants

ADVANTAGE OF SEEING is brought home to employees every time they open their lockers with this "locker pin-up girl"

Keeping weak links out of

Here's how a variety of steps add up to safety at Chain Belt

OUR company is unusually conscious of the old saying about chains and weak links. This may be the reason for the success of our safety program, which in seven years has cut the accident frequency rate in half.

Because 85% of accidents result from unsafe acts or human failure, we have built our program on the premise that *every* employee must develop safe thinking.

Coordination is by the safety director, but all safety activities are conducted through the production supervisors, not around them. This means that supervision accepts all responsibility for accidents and is reponsible for training and safety contacts with men.

Key steps in maintaining safety consciousness are:

1. Company-wide safety meetings are held four times a year with all 1500 shop employees attending in groups of 25 to 200. Held during working hours, the meetings last 30 to 45 minutes, each covering a particular phase of accident prevention. Films, slides, and charts, as well as talks are used to stress the points at these meetings.

2. Plant safety committees are made up of one member from each department, elected by employees for a term of one year. The committees meet once a month with plant superintendents and the safety director to discuss accident prevention problems department by department. Each of these meetings produces a number of specific ideas for reducing hazards and for promoting safety consciousness.

3. Monthly employee contact with each worker on some phase of safety. Each supervisor receives a monthly contact record with suggestions of subjects to stress in talking to his men. On the reverse side the supervisor lists the name, clock number, and date each time he talks safety with an employee.

Subjects Stressed in Monthly Contacts

JANUARY	Falls
FEBRUARY	Plant Housekeeping
MARCH	Safety Shoes
APRIL	Eye Protection
MAY	Materials Handling
JUNE	Vacation Safety and First Aid
JULY	Protective Equipment
AUGUST	Machine Guarding and Machines
SEPTEMBER	Power and Hand Tools
OCTOBER	Fire Prevention
NOVEMBER	Traffic Safety
DECEMBER	Home Safety

He is expected to make such a contact with each employee under his supervision at least once during the month.

To avoid monotony in these talks, a new subject is stressed each month during the year. Often booklets dealing with the subject can be secured from insurance companies or the National Safety Council and are made available to supervisors to give to their men when it seems appropriate.

Keeping men conscious of the need for safety glasses is always a major problem. At Chain Belt we have created the "Locker Pin-Up Girl." This 5x7-in. sticker is gummed to stick on the inside of locker doors. When the locker is opened, the average man finds it difficult to resist a glance at this shapely lass—and at the reminder of the advantages of eyesight and the need for safety glasses.

Three portable boards each display nine damaged pairs of safety glasses each of which is accompanied by an account of the serious eye injury it prevented. These boards circulate from department to department through the three divisions of the company.

Another step in keeping supervisors safety conscious is the

safety

BY A W BATHKE
Safety Director
CHAIN BELT CO, MILWAUKEE

monthly report on the number of doctors cases. A separate report to each supervisor shows the number of cases this month and last month from his department, including the medical and compensation costs. To provide an immediate flash, the report is on a green card when the number of cases is down, yellow when it is the same, and red when there has been an increase.

Monthly safety reports summarize safety statistics for the month and year to date, discuss any lost-time accidents in detail. Posted reports list each department by rank and give the cost of accidents for the month and the year to date. Rank is determined by the cost per thousand hours worked in each department.

Because of the importance of housekeeping to safety, a "golden broom" contest is run monthly between plants, with a plaque going to the plant with the best record for the full year. Last year the Construction Equipment Division (Plant 3), bearing out the relation between housekeeping and safety, won both the Golden Broom Plaque and the President's Safety Trophy. To make it a clean sweep, they also won a special award from the National Safety Council as the safest in their section of the Accident Prevention Contest.

Regular articles in the plant newspaper reporting safety activities, accounts of employees who avoided injury by wearing proper equipment, and contest winners contribute to safety consciousness.

Our supervisors have set as their goal elimination of all accidents. They want Chain Belt to be known as the safest place in the world to work. We think it can be done.

Accident Frequency at Chain Belt

Year	Frequency	Hours of Exposure
1945	22.4	5,334,327
1946	16.4	3,405,656
1947	16.9	4,473,681
1948	13.8	4,574,428
1949	10.3	3,665,005
1950	13.08	4,509,976
1951	10.56	5,393,075
1952*	9.10	3,076,069

* Six months

How much space is required in a new plant?

How can space be saved in existing plants?

Which handling method makes best use of building space?

Answers to these questions can be figured rapidly with a new formula developed both for estimating space and for checking on how effectively it is being used. Described here, this new method shows how . . .

Better Handling Saves Building Space

By JOSEPH E. WILTRAKIS, Assistant Superintendent, WESTERN ELECTRIC COMPANY, Kearney, N. J.

Less than 40 years ago, materials-handling facilities were a small part of the investment of a typical metalworking plant. Labor was freely used. Today, with increasing labor costs, investment in material handling equipment is increasing rapidly. Yet conservation of labor actually is but one of the reasons for introducing mechanized handling methods.

One of the largest single items of plant investment frequently is in buildings. According to recent studies, however, only 20% of the floor space of many manufacturing industries is required for productive facilities. The remainder is divided between storage, aisles, plant services, offices, employee services, and other activities related to production. By making better use of this space, considerable savings can be made in many plants.

One of the main avenues for improving space utilization is through the introduction of better material handling methods. However, as new equipment often is needed, this leads to the question: **Is there a quick method of analyzing space utilization to determine whether it will pay to improve material handling methods and facilities?**

Material handling, in this case, is defined as material being transported or stored, occupying space in an immobile or a mobile facility. The approach assumes that material handling is always a space problem and that the objectives of space utilization and material handling are essentially the same.

How to Estimate Space

From this starting point, it then is possible to apply quick methods of analysis based upon a formula and graphic illustration. By comparing actual utilization of space with the maximum possible it often is possible to establish criteria as to whether or not new methods should be sought. The objective, in all cases, should be lower costs and full operator safety, while maintaining normal quality and production standards.

Various methods are used by executives and engineers to estimate floor space. Ratios are developed such as floor space per $ of annual output, floor space per employee, or per ton of inventory. In many cases, these simple ratios are excellent rule-of-thumb methods for controlling and estimating plant needs, especially in single-purpose plants such as a television plant making a million sets a year, or a warehouse storing tons of steel. Space needs, however, are complicated in multi-purpose plants or warehouses where a variety of products customarily is stored.

HOW TO APPLY THE SPACE FORMULA

SPACE REQUIRED FOR PLANT

(a) Average gross area per employee:

	Sq ft
in office and shop	100
auxiliary space, i.e. files, tool rooms, etc.	25
Employee services	75
	200

(E) Number of day-shift employees, office and shop: 1,000

(I) Pounds of inventory:

Raw material	3,000,000
Parts	4,000,000
Assemblies	2,000,000
Finished product	1,000,000
	10,000,000

(u) Utilization of space by inventory-coefficient of inventory divided by space used in stores, receiving, packing, shipping: 50 lb/sq ft

(D) Includes allowance of 10% for changes: 110

$$S = \left[OE + \frac{I}{u} D \right] 110$$

$$= \left[200 \times 1{,}000 + \frac{10{,}000{,}000}{50} \right] 110$$

$$= 440{,}000 \text{ Sq ft}$$

FIG. 1 . . . Layout of hypothetical plant shows space factors that apply in each plant area. Computation at right applies values for factors in each area, giving total sq ft of space required for plant. Analysis of handling methods may permit appreciable savings.

Adapted from a paper presented at the Centennial of Engineering Meeting, ASME, Chicago, Ill.

$$S = \left|\begin{matrix} \\ \end{matrix}\right. aE + \frac{I}{u} \left|\begin{matrix} \\ \end{matrix}\right. D$$

SPACE ESTIMATING FORMULA

S = Total space in building.
a = Area per average employee.
E = Total day employees.
I = Total inventory to be contained in building in lb or $.
u = Utilization of space by inventory in lb or $ per sq ft.
D = Factor for dynamic conditions such as growth, changes, etc.

The formula developed by the author permits rapid analysis of plants or warehouses under all conditions. Consideration is given the employees, the inventory, and dynamic condition factors.

In applying the formula, the average area per employee, *a*, includes all the productive machines, and bench and office facilities together with such auxiliary services as may be necessary. Factor *a*, should exclude space for any large quantities of material stored adjacent to the productive positions, as space for this process inventory should be analyzed from a storage point of view. Other factors can best be explained by taking a plant, Fig. 1, as an example.

At the front of the building are offices and miscellaneous employee services such as lunch room, hospital, toilets, lockers, employment department and similar services. The *aE* employee factors are the principal factors for this space. The policy of the company, the needs of industry, and other considerations affect the space provided per employee and the employees required.

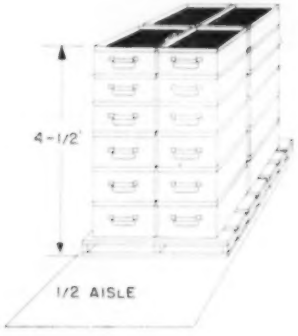
What Affects Space Needs

The number of office employees required, however, is a function not only of the type and quantity of production, the efficiency of the employees, the supply problems, and the consumers' needs, but also of the amount of space and the material handling methods and facilities. Methods of storing, recording, scheduling, selecting, transporting, and controlling inventory may affect greatly the number of workers needed.

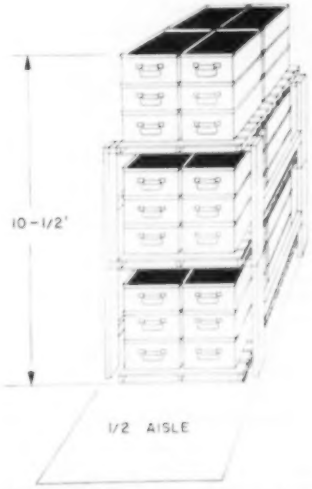
The manufacturing area provides space for operators, machines, benches, and auxiliary equipment such as the tools required for operations. Space is required not only for the employee *aE* factors, but also for inventory $\frac{I}{u}$ factors such as in-process material. Material handling engineers frequently can assist by recommending changes which will keep at a minimum the area for the machines and the inventory to be stored adjacent to machines.

The quantity of space required for receiving, shipping, and storage areas is determined by the size of the inventory, *I*, and the utilization factor, *u*. Based on the assumptions used, the over-all space required for this plant is 440,000 sq ft, divided as shown in Fig. 1. Of this

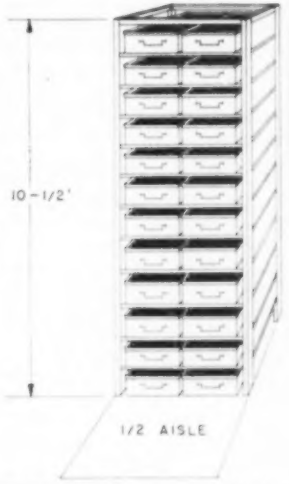
HOW HANDLING METHODS AFFECT SPACE UTILIZATION



METHOD A: Single pallet located by hand electric truck from 10-ft aisle. *u* = 32 lb/sq ft



METHODS B AND C: Three pallets stored on racks by fork truck:
B: from 10-ft aisle. *u* = 48 lb/sq ft
C: from 7-ft aisle. *u* = 58 lb/sq ft



METHOD D: Individual trays stored by hand or special lift from 3-ft aisle. *u* = 103 lb/sq ft

"AREAGRAM" COMPARES HANDLING METHODS

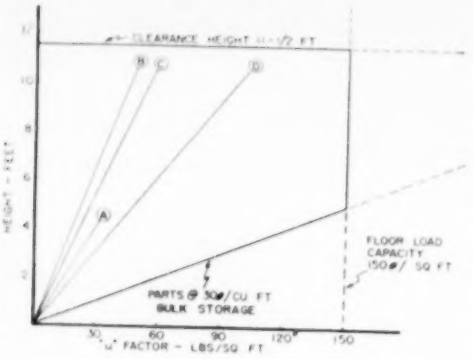


FIG. 2 Areagram compares the four methods of storing and handling (previously illustrated) against the capacity of the building. Method *D* permits utilization possible with mechanized handling

50% is for receiving, packing, and shipping, and for storage both in storerooms and in areas adjacent to operating positions.

How to Save Space

Having determined over-all space needs, the question comes up as to whether any of this area can be saved. First of all, the quantity of inventory in any given plant is a function of outside supply conditions, the types and quantities to be produced, and the customers' needs. It also is a function of the speed of handling within the plant, the number of times material must be handled, and the ease of selecting, storing, and packing of products and their components. Better handling often reduces inventory and the space required for storage. In addition, improved handling methods also can improve the utilization factor, still further reducing the space needed to store a given amount of inventory. To see how this can be done, consider the hypothetical plant once more.

The utilization factor in this plant is 50 lb per sq ft. Our objective now, is to discover if storage methods can be improved. The floor capacity in many plants frequently is in excess of 150 lb per sq ft. Should we be satisfied with using only a small part of our capacity? What criteria should we use? First of all consider typical conditions in the plant.

In many of the storerooms are parts such as formed springs, brackets, and small covers, which because of their shape weigh 30 lb per cu ft. In areas adjacent to manufacturing operations, this material may be stored on pallets by industrial trucks requiring a 10-ft aisle, as illustrated by Method *A*. After allowing for one-half of the aisle space, for the space occupied by the single pallet, and for a small amount of space around the pallet for handling, we find the *u* factor is 32 lb per sq ft.

By stacking these pallets three-high in a storeroom with the same trucks, the *u* factor for Method *B* is increased to 48 lb per sq ft. When newer trucks are used, requiring seven ft aisles, Method *C*, the utilization factor for these same typical parts, becomes 58 lb per sq ft.

Method *D* consists in storing the trays in high racks by hand, or a special tiering device using narrower aisles approximately three ft in width. The utilization factor is increased greatly to approximately 103 lb per sq ft.

If the pans were stored only five ft high in solid stocks, it would be possible to obtain a *u* of 150 lb. However, special means would have to be devised to make each pan readily accessible. The building characteristics such as allowable floor load and building headroom greatly influence the storage method finally selected.

"Areagrams" Compare Methods

To visualize the prevailing conditions, an "areagram", Fig. 2, is extremely helpful. The "areagram" shows that storage methods are at times limited by the height of the building, by the density of the typical parts, and by the allowable floor load of the space. When the floor load is unlimited, the "areagram" becomes a triangle.

This type of graphic representation indicates clearly that existing methods may be providing only 10% to 20% utilization of existing space. The "areagram" immediately shows designers, engineers, and executives the possibilities for improving space utilization.

These people may be stimulated to obtain a number of answers, which, in the end, may provide urgently needed space and reduce over-all costs. These include rental, moves, and rearrangements, the costs of equipping the space, production losses, material losses, and the many items of cost which can be improved by better space utilization combined with proper material handling methods. Labor and office costs are lowered if travel time is reduced and if inventory is readily accessible when needed.

Checking Multi-purpose Plants

If the plant is a multi-purpose plant, and if it is necessary to provide accessibility to various parts and assemblies when stored, the problem of determining the efficiency of space utilization may at first appear difficult. The problem, however, can be simplified greatly: (a) by dividing all material into a few representative types (b) by selecting typical material handling methods; and (c) by determining the floor-space limitations such as clearances and floor capacity.

Improvements, at times, may be attained by no change in material handling facilities, but by the introduction of improved inventory control and storeroom routines. In other cases, the analysis of current conditions automatically determines the selection of the type of facility which is needed. Imagination, ingenuity, and determination may be required to develop new ideas, methods, or facilities. Control or even reduction of space may be a means of controlling inventory investment and over-all costs. But space reduction should not be an objective in itself. It should be used only if over-all costs can be lowered, and safety, production, and quality standards maintained.

ROUND TABLE

Double Standard

"I want to talk to you, Ed, about double standards—and I don't mean in marriage. I'm sick and tired of this old-fashioned idea of having different sets of tolerances in the engineering department, the shop, and in inspection. It's time we fixed 'em."

"What do you mean, Al? We stick pretty close to engineering tolerances, unless they're too tough. Once in a while, the engineers set 'em too close—some place where it doesn't matter—so I just ease 'em off to cut cost and time. If I'm smart in picking the places, nobody argues as long as the tool works."

"That may be all right on tools, but it doesn't work on production. Between regular inspection and spot checks, any easing of the tolerances will get me in trouble. And I've got to be inside tolerances anyhow, because inspection gages might be a little different than mine."

"Look, Al, engineers always like to set close tolerances, and nothing we try to tell 'em about how expensive it is to have tolerances too close will make any difference. The only way is to relax 'em on dimensions that don't matter and won't get checked."

"Sometimes Inspection isn't too careful on those dimensions, too—and that's what brings me to my real gripe. Who's kidding who, anyhow? I know that, a lot of the time, Engineering sets tolerances for us that are actually tighter than the specs required. We try to produce to the tight ones, then Inspection works to looser ones. If the looser ones are all right, why don't we work to those in the first place?"

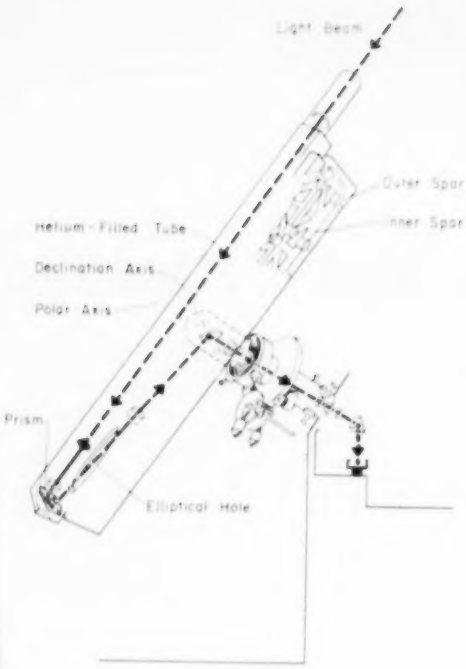
"That's the old Army game, Al. We kid Engineering by letting 'em set tighter standards than we can make at the price, then we don't hold 'em. And Inspection kids us by having wider tolerances than we think they have. And I bet that Engineering thinks it's kidding us on the tight tolerances, too!"

"That's what gripes me, Ed. Why does everybody have to kid everybody else? Why don't we have one set of prints, with fixed tolerances, so everbody knows where we stand? Then we're all talking the same language. If the tolerances can be wide, let's start out with everybody knowing it, and that's going to save the boss money. And let's find out, when we go outside, whether it's the fault of the operator, the machine, or the tolerances to begin with."

"You're certainly the sweetness-and-light boy today, Al! Do you expect that, if everybody knows the right tolerances, that would change anything? We'd still all be easing 'em where we could, and yelling when we got caught. Nope, we might as well set the standards high, so we've got a mark to shoot at."

"The double standard again, eh, Ed? Mark my word! All the double standards are breaking down, and this one is no exception. It's time we got to be realistic and had only final dimensions, with the shop responsible for meeting 'em—making its own allowances for roughing, lapping, plating, and all the rest."

***SHOULD** tolerances be set in the shop? Is the practice of setting tighter tolerances than necessary as a psychological move worth its added cost? Your ideas or opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*

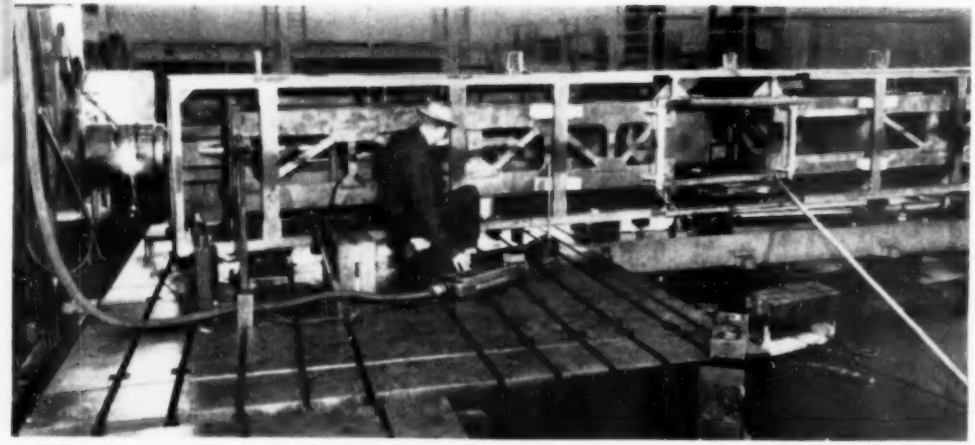


Smart Tooling Solves Tough Elliptical Boring Job

Ingenuity in tooling and setup permit precision elliptical boring in holes spaced over a distance of more than 13 ft. Tooling is simple and inexpensive for a difficult operation on complex instruments for solar research

EQUATORIAL TABLE CORONOGRAPH produced by Westinghouse for solar research contains optical instruments mounted in a spar 26 ft long. Light beam must pass through structure in precise angular relation to declination axis. This required unusual boring setup to produce elliptical hole in sidewall, shown, and in trusses

By S DALE PHILLIPS
WESTINGHOUSE ELECTRIC CORPORATION, Sunnyvale, Calif.



BORING OPERATION was set up on No. 570 G & L. Problem was to locate large spar so true hole could be machined at an exact angle through ⅝-in.-thick steel plate on opposite side of spar and also through several members of truss arrangement visible within spar

Two 26-ft "equatorial table coronographs," multiple telescopes for solar research, have just been completed at the Westinghouse Sunnyvale plant. In each coronograph, optical instruments are mounted on the surfaces of a box-like, rectangular spar, 26 ft long and 40 x 32 in. in cross-section. Formed of 5/8-in.-thick steel plate, this outer spar, or "optical bench," is supported by a truss-like inner spar.

Machining Requirements

In operation, a 7-in.-dia beam of light will pass through a helium-filled tube mounted on the top surface of the outer spar. This beam must travel from a prism at the lower end of the 26-ft spar to the declination axis at the center of the spar. Entering the spar at a 7° angle, the light beam must retain exactly a 7-in. diameter as it passes through various baffles and steel plates between the prism and the declination axis. This distance is a little greater than 13 ft.

These requirements presented the difficult problem of machining a true hole through an arrangement of welded structural members with seemingly no support for the very long boring bar required.

To preserve its strength, the inner truss was designed with minimum clearances for the 7-in.-dia hole. Before the unit was stress-relieved, certain juxtaposed baffles were cut with a torch, leaving a 1/2-in. machining allowance.

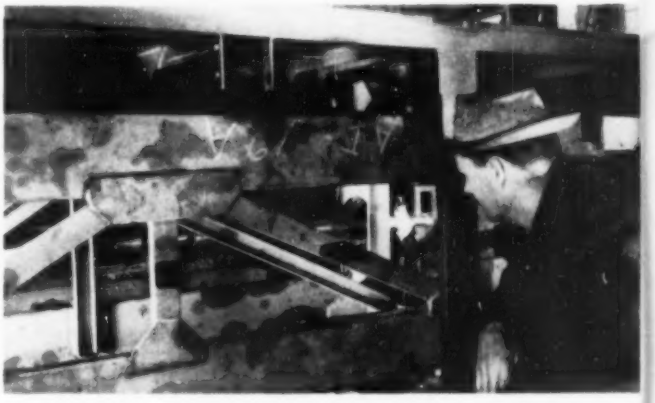
How to Set Up the Job

In setting up the job, the boring-mill table was used as a layout loft on which an axial center line was laid out. Another line through the declination axis and intersecting the axial center line at a 7° angle was drawn. At the point of intersection of the two lines a vertical spud was set. The assembled spars then were set over the spud, which assimilated the declination axis.

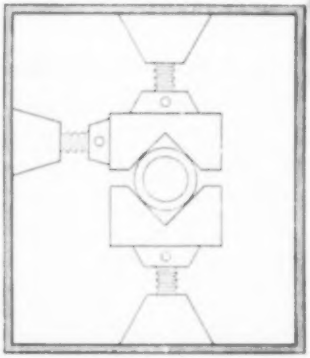
The assembly next was brought to a position that made the already-finished bores for the declination axis bearing concentric to the vertical centerline of the spud. The axial centerline of the spar was, at the same time, made co-incident with a vertical plane running through the 7° line. The spars then were positioned so the boring-mill spindle pointed directly at the point of intersection of the declination axis and the polar axis.

With this setup it then was possible to bore to required accuracy with the tooling shown in the accompanying pictures. In boring the internal members, flycutters were mounted in the boring bar at each location where a hole was to be bored. All holes were bored simultaneously and only a small axial feed was required to complete the boring operations. In this way, a difficult job was performed with very little special toolng—an important consideration an any job such as this, where production quantities are necessarily low and repeat orders unlikely.

ELLIPTICAL HOLE was bored with flycutter. With 2-ft long boring bar support, cutter was sufficiently rigid for first 5 ft of cut. Angle of spar with table of boring mill is clearly visible

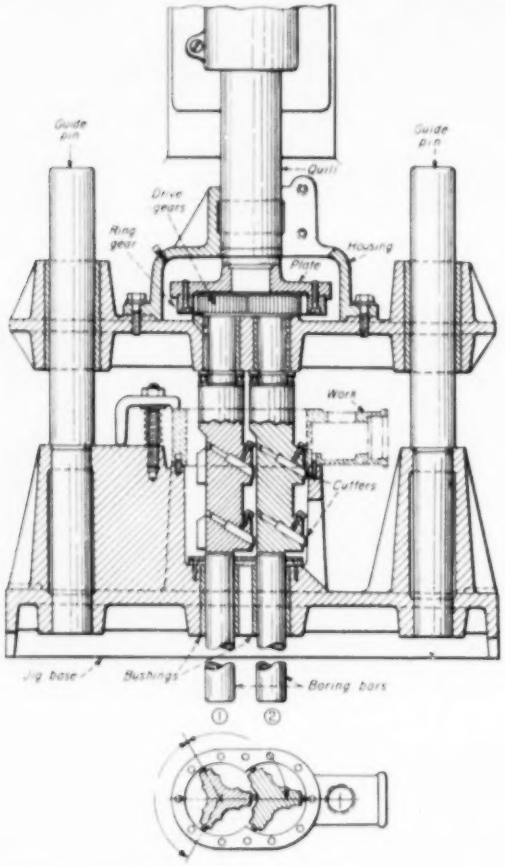


INTERIOR MEMBERS were elliptically bored with cutter held in long extension supported at free end by special bearing shown just to right of toolbit. Bearing was adjusted for zero reading on indicator attached to boring bar before toolbits were inserted and cut was started



SPECIAL BEARING consisted of bronze sleeve supported between two special V-blocks adjustably mounted on screw jacks

Practical Ideas

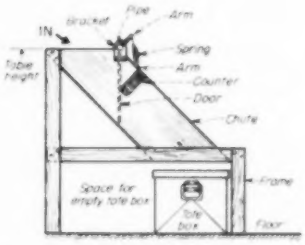


Jig Bores Two Holes at Once

To avoid most of the troubles encountered in jig-boring a part such as the gear-pump base shown, we designed this jig. A jig-borer is not necessary and a fairly accurate drilling machine or drillpress will work very well. The jig base is clamped to a drillpress table, and the ci housing for the twin spindle is clamped to the drillpress quill. The jig, itself, resembles a dieset: Fastened to this housing is a bracket which guides the housing. Within the housing is a plate fastened to the drillpress spindle and containing an internally geared steel ring. This internal gearing drives a small gear fastened to boring bar 1, and that gear drives another gear on boring bar 2.

The two boring bars rotate in bronze bushings which are pressed into the bracket and also into the jig base. Axial thrust is absorbed by ball-bearings, and the part to be bored is located and clamped on top of the jig base. One upper and one lower set of cutters (conventional toolbits) is mounted in each boring bar. Three cutters constitute a set and each set is arranged in a circle around the bar. The lower set is for roughing and the upper set does the finishing. Two of the cutting tools are always in contact with the working surface and act as a pivot for the boring bars during the boring operation.

With this boring method it was possible to hold the tolerances to within 0.001 in. and the operation speed was increased more than 100%. *Hjalmar Dahl, Upplands Vasby, Sweden*

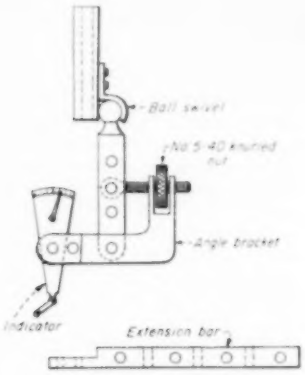


Part Counting Stand

To simplify counting and handling parts after such operations as filing, sanding, grinding, milling, drilling, and tapping, an inexpensive part counting stand placed at each machine and bench is sometimes useful. This stand is designed to tabulate each finished part as it slides down a chute through a swinging door built to open under the weight of the part. This door, in turn, operates a counter and the part falls into a tote box at the bottom of the chute.

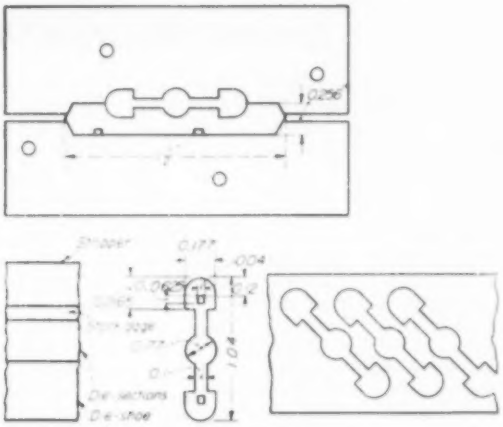
Part counting stands enable the production supervisor to see at a glance which operations are creating a bottleneck and also prevent damage to parts as the chute allows the parts to slowly slide down and fall gently into the tote box.

The stand consists of a frame supporting a chute having a swinging door which is held in position by a piece of pipe or rod. A small arm is fastened to this rod and to this arm is attached a spring which actuates the counter. *Fred Lettino, Astoria, N. Y.*



Adjustable Holder for "Last-Word" Indicator

Here is a simple holder, made of CRS, that will speed the set-up of drillpress, jig borer, or milling machine. It consists of an angle-bracket, an adjusting screw, and a vertical rod which, through a ball-swivel, is attached to the round bar that enters the machine collet. Fine adjustment is provided by the No. 5-40 screw and knurled nut. When large diameters must be indicated, an extension bar of suitable length is attached to the angle-bracket. This extension bar is made from 5/16-in. square stock. An attachment can be made which will permit the use of this adapter with a dial indicator. *Harry H Opanowicz, Newark, N J.*



Maintain Alignment In Small Sectional Dies

Composite dies have certain advantages over solid dies, but they create problems such as maintaining alignment between the sections and providing efficient section clamping. With large dies it is comparatively easy to locate an adequate number of dowel pins and clamping bolts. In very small dies this is seldom so simple a problem.

In designing a small progressive die, I solved the problem of alignment and clamping so that one of the sections has no alignment pins or clamping screws. The die consists of three parts, of which the center section is chamfered at both ends to mate exactly with chamfered corners in the two lateral sections. These lateral sections are sufficiently wide for adequate clamping and alignment holes. A strong, welded frame (not shown) helps to bind the three sections together, and prevents their opening during cutting.

The workpiece was produced from very thin phosphor bronze sheet. Small dimensions and close tolerances necessitated a sectional die construction. ***Federico** Strasser, Santiago, Chile*

Ratio Determines Depth of Thread Chasing Feed

When chasing threads on a lathe the thread depth is usually calibrated by cutting a minor dia on the work prior to starting the thread. Then, the compound feed is used to advance the tool into the work until, by successive cuts, the predetermined minor dia is reached.

Use of this minor dia entails producing it and cutting it off after thread is finished. The correct compound-rest advance can be determined by the thread pitch. But two constants are used and the method prohibits checking.

A third method is more desirable. Between the thread depth and the length of the thread flank there exists a positive ratio which, by trigonometry, shows that the length of the thread flank is 1.15 times longer than the thread depth.

Thus, the compound rest must be advanced 1.15 times more than the crossfeed would be advanced to provide a screwthread with a proper minor dia. In practice, the work to be threaded is turned to the correct major dia, the thread depth is determined from the thread tables and multiplied by the constant, and the required compound-rest advance is determined. Then, the number of cuts and their depth are determined and cutting is started. This is continued until only one cut remains uncompleted, at which time the work is micrometered and corrected.

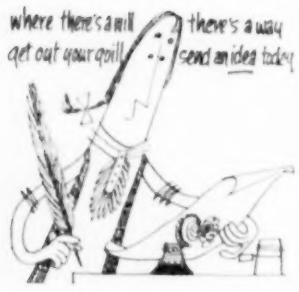
To make a correction the minor dia is subtracted from the micrometer reading, and the difference is multiplied by the constant 1.15. This will give the compound-rest advance necessary to provide the proper finished dia. Only one number, 1.15, must be remembered. This is used with any 60° thread. *Wm R Kampe, Brooklyn, N Y*

Trouble Shooting Die Maker

While working as a trouble shooter in a tool room making press tools, I found lots of trouble to shoot at. To help you lick similar problems, I have outlined some of mine, together with the methods used to overcome them.

My No. 1 headache was scrap slugs returning to the space between the die and the stripper. This was frequently caused by bell-mouthed piercing holes in the die. To cure it, the hole was lapped back to the right shape when the extra size was permissible. If this was not possible, the worn hole was drilled out with Stellite drills and bushed. If the hole had been bushed previously, a new bushing was made and clearances were kept at the minimum.

Sometimes the trouble was traced to excessive clearance between punch and die, and on other occasions a tool which had run well for several days would begin to intermittently show this trouble. We would find that as we got deeper into the batch of steel, some of the strips were much harder than the normal stock. This hard steel was producing slightly smaller parts as a result of its cleaner fracture, and these parts were not gripping the die, but returning on the punch. To combat this condition the end of the punch was ground convex, which tended to make the parts bigger, so that they straightened out and gripped the die as they were released by the punch. When we could not afford to tear down the setup a toolmaker would India stone a chamfer on four sides of a round piercing punch. This was successful in all but the worst cases. Sometimes, however, the only remedy was to make a new punch, with a spring-loaded pin incorporated in it, to shed the slug.



When parts are to be tapped, a small extrusion is formed around the hole to increase the thickness. This is often pierced and extruded by the same punch and the slugs frequently come back and land on top of the strip, frequently marking the blanks when they get under the punch. This is overcome by making two diameters in the piercing hole, one to suit the outside of the extrusion, and another lower in the die to grasp and hold the slugs.

A new pierce and blank tool, making parts about $\frac{3}{4}$ in. x $\frac{1}{2}$ in. from $\frac{1}{8}$ in. steel strip, produced parts as much as 0.020 in. off-center. These parts had a 3/16-in. dia hole pierced in the center. As the blanking punch was fitted with an accurate close-fitting pilot, it was assumed that the part was deformed during the several previous stages, and the tool was shelved as poorly designed. I suggested that the trigger stop was out of position, but was told that this could not be the cause as the large pilot would pull the strip back into position. I persisted in my theory and had the stripper drilled and tapped to take an adjusting screw. This enabled the trigger to be put back into position and from then on accurate parts were produced.

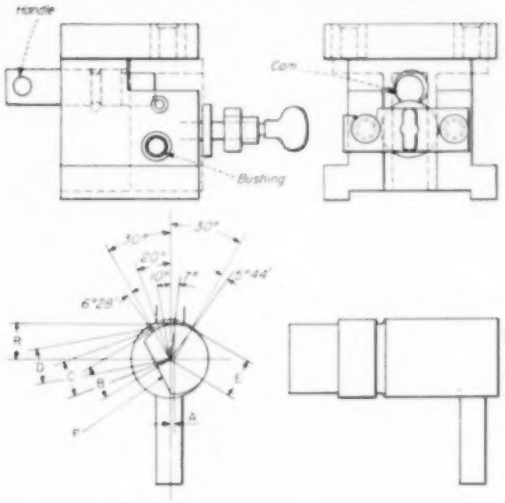
A multi-stage pierce and blank tool was brought in from a subcontractor because many of the parts they had produced for us with the tool had been inaccurate. Investigation indicated that the tool was satisfactory and the subcontractor assured us that the strip was correct in width. As we seemed to be at loggerheads I visited the subcontractor and found that the strips were of the proper width, but varied very slightly in length. On certain lengths, two piercing punches cut two half-holes on the end of the strip. This deflected the punches slightly and they were still deflected when the operator started the next strip, but they realigned themselves with the die as the strip went through the tool. This was corrected by cropping the strips to the proper length before they were used. Of course, by the time the tool had reached the shop for checking, the punches had worked back into alignment.

As Industry finds it necessary to use an ever-increasing supply of inexperienced labor, it becomes even more important to be constantly alert for the little things that we have otherwise taken for granted. When, within a short time, two expensive dies were fractured in use, we traced the cause to the man who made them. He had surface-ground both dies between the hardening and tempering operations, so that he could better see the colors. This caused hair-cracks which enlarged in tempering and then broke completely under working strain. After that all toolroom personnel were educated to the dangers of grinding hardened steel.

Cracks which developed in bronze parts during a bending operation were traced to the metal shearing shop, where the sheets had been sheared so that the grain of the material ran in the direction of the bend instead of across it. This was cured when the sheets were cut with the grain flow in the proper direction.

When swaging small steel parts, punches failed with monotonous regularity. The best steels available were used, and heat-treatment was carried on with the skill of a surgical operation, still they broke. Finally, press speed was reduced and the excessive punch breakage was eliminated. It was found that the metal would flow with much less resistance at the slower press speed, hence pressure on the punch was greatly reduced. *Howard Morgan, Cedar, BC, Canada*

Cam for Jig Clamping

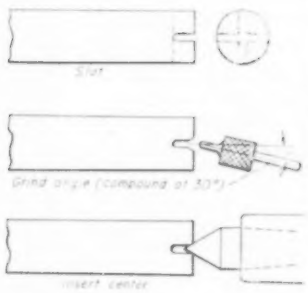


Eccentricity per radius

R	A	B	C	D	E	E-B
0.500	0.061	0.469	0.479	0.490	0.531	0.062
0.437	0.054	0.410	0.419	0.428	0.464	0.054
0.375	0.046	0.352	0.359	0.367	0.398	0.046
0.312	0.038	0.293	0.299	0.305	0.331	0.038
0.250	0.031	0.235	0.240	0.245	0.265	0.030
0.218	0.027	0.205	0.209	0.213	0.231	0.026
0.187	0.023	0.176	0.179	0.183	0.198	0.022

There is a unique eccentric cam that can be conveniently used for clamping in many designs. As shown, the eccentric is turned from bar-stock, which has a minimum diameter of 2R + 2A. This eccentric serves as a pivot in the properly placed bearing hole of the fixture. A pin is provided to act as a handle, and a stop is used to locate lengthwise. In this case, the stop is in the form of a groove and pin.

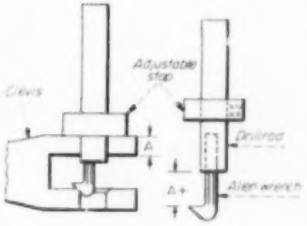
The table contains a column giving the eccentricity for each radius, based on a friction angle of 7°. This friction angle varies because the theoretically required evolute is replaced with an eccentric. However, the decrease of the angle makes the holding power even better. Columns *B*, *C*, *D*, and *E* give the distance from the journal to the tangential points at various angles. The surface to be clamped is assumed to be straight. Cut "F" provides additional clearance if this should be necessary. Cams can be air or solenoid operated. *R Mery, Annadale, N.Y.*



Grinding Centers for Hardened Parts

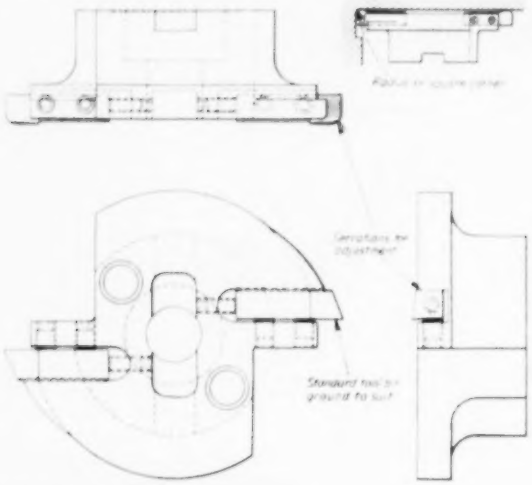
It is sometimes difficult to produce a good center in a hardened steel part. This was the problem that faced us when we were required to grind some old parallel reamers into taper reamers and gages. The parallel reamers had been cut down and had lost their centers. By slitting their ends into a "cross" and grinding the intersection with a mounted wheel point set up in the lathe, we quickly produced very good centers.

Cut-off wheel thickness should be about one-half of the diameter of the completed center. The wheel is simply aligned with the center of the stock by eye. After slitting, the centers are ground with a grinding attachment mounted on the lathe compound-rest, which is set at a 30 deg. angle. If these operations are done with care, runout will be negligible. This technique is more accurate than grinding a male center onto the workpiece for use with a live female center, as it is seldom possible to readily center a live female center in place. *Neville Palmer, Paddington, Australia.*



Simple Tool Cuts Hidden Chamfer

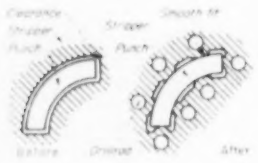
An Allen wrench was sharpened for use as a toolbit, drillrod served as a toolbit holder, and a disk made an excellent adjustable stop. By keeping the distance between the pilot and the tool greater than the thickness of the opposite leg of the clevis, the tool will chamfer freely without getting caught. *Ralph J Rossi, East Boston, Mass.*



Grooving Cutter Uses Carbide Toolbits

Using $\frac{3}{4}$-in. sq standard carbide toolbits, serrations are milled on the bottom side of the toolbits and in the cutter body. A blade adjustment is provided which permits positioning as closely as 0.001 in. and is locked with a socket setscrew. This cutter body may be adapted to any milling machine. The blades may be machined or hand-ground, but should be set on an indicating fixture.

This cutter has been successfully used on many jobs in our shop, jobs that were originally done on a planer at considerable cost. By doing the operation on a milling machine with this cutter, machining time is halved. *Stanley Kusner, Cleveland, Ohio*



Simple Trick Saves Toolmaker's Time

We have found that excessive clearance between the punches and the stripper was causing our die trouble. To have the toolmaker make a new stripper would greatly delay production. By a simple trick the useless stripper was fully reclaimed within a few hours.

Around the profiled holes in the stripper, a number of holes about 1/16-in. dia., were drilled and reamed through. These holes were spaced about 1/32-in. distance from the profiled holesides. After this, with the punches positioned in the stripper and die, pieces of straight and hardened drillrod, slightly larger than the holes, were hammered into the holes to make the stripper material bulge against the punches. Thus, the profiled holes fit smoothly against the punches in a number of spots.

We are considering using this technique on new tools as well, to avoid elaborate working through operations. If wear should occur after long use, the process can be repeated by driving out the existing drillrods and replacing them with the next larger size. *R. Kreuger, Eindhoven, Holland*

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PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

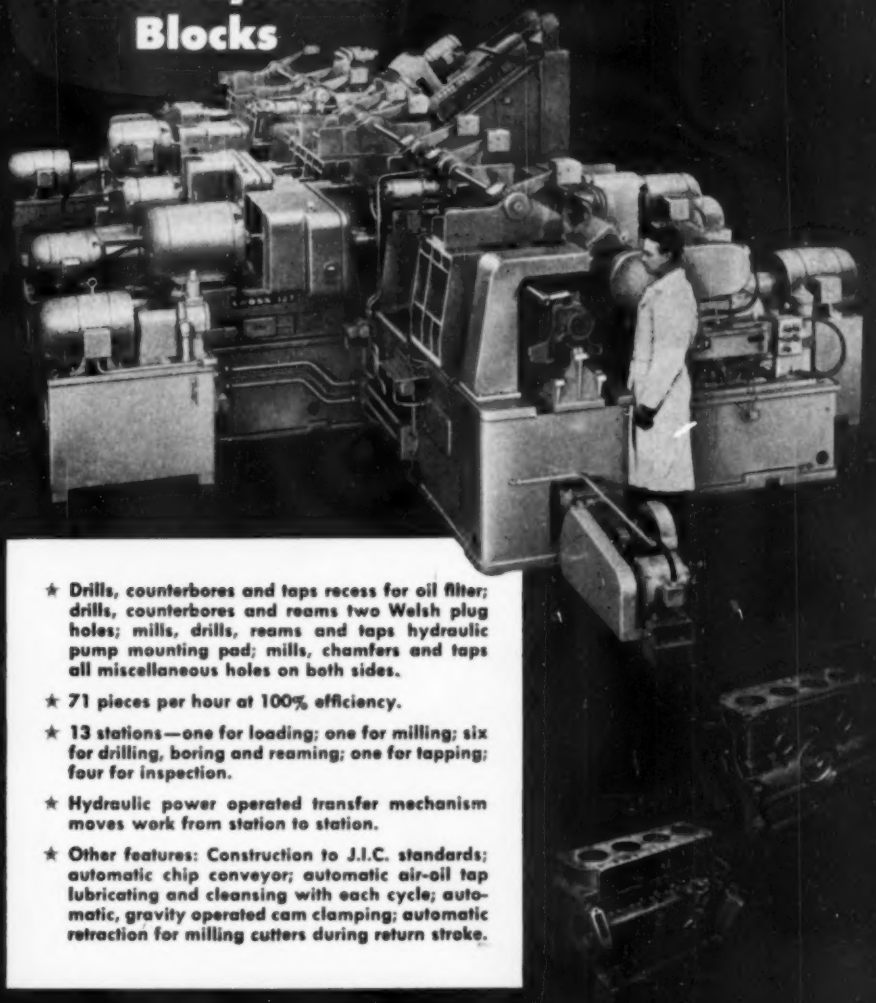
REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 36, N.Y.

Mills, Drills, Bores and Taps Tractor Cylinder Blocks

Another Transfer-matic by Cross



- ★ Drills, counterbores and taps recess for oil filter; drills, counterbores and reams two Welsh plug holes; mills, drills, reams and taps hydraulic pump mounting pad; mills, chamfers and taps all miscellaneous holes on both sides.
- ★ 71 pieces per hour at 100% efficiency.
- ★ 13 stations—one for loading; one for milling; six for drilling, boring and reaming; one for tapping; four for inspection.
- ★ Hydraulic power operated transfer mechanism moves work from station to station.
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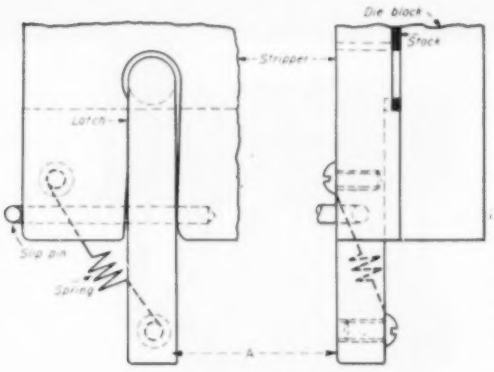
Stops for Dies...I

BY PETER BALSELLS

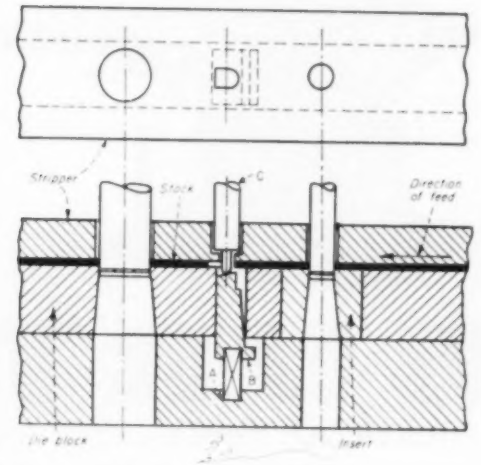
The purpose of a stop is to position the stock in the proper place before or after each press stroke. Thus, the spaces cut in the stock remain at a uniform and predetermined distance. Blanking, progressive and compound dies are generally built with some type of stop. Design is controlled by die operation and use.

STOPS FOR PROGRESSIVE DIES



Perhaps the most widely used in progressive dies, this stop is mounted on the stripper plate. It consists of a latch which is pivoted on a pin, and two screws holding the spring. The latch has an up-and-down motion, when in contact with a screw located in the punch holder (not shown). The slot in the stripper plate, where the latch fits, is tapered so that it comes to rest on top of the stock during and after operation of the die. The arrow indicates the direction that the stock moves.

The mechanism works as follows: The stock is pushed forward against the latch, moving it to the far end of the tapered slot in the proper position for locating the stock. When the press comes down and the blanking punch comes in contact with the stock, a screw (located in the punch holder directly above the latch) hits the latch at *A*. The opposite end of the latch is raised in contact with the stock. At the same time, the spring forces the latch to the opposite end of the slot. When the ram ascends, and the screw in the punch holder is no longer in contact with the latch, the latter comes to rest on top of the stock, instead of the blanket slot. Therefore, the stock can be moved forward until the latch falls into the slot just blanked. The latch is again moved forward by the stock and placed in position for the next blanking operation.



A spring-loaded stop can be mounted between the die block and the die shoe. The mechanism consists of spring *A*, latch *B* and pilot *C* mounted in the punch holder. A countersunk blind hole in the die shoe accommodates the spring *A* and latch *B*. When the press comes down, latch *B* is given downward motion by pilot *C*. When the latch *B* is no longer in contact with pilot *C*, spring *A* returns the latch to its original position. The latch *B* is tapered on one side and top. The side taper is about 2° and the top taper is usually 10°.

The mechanism operates thus: The stock is moved forward against latch *B* in the proper position for locating the stock. When the blanking and piercing punches come in contact with the stock in the downward stroke of the press, pilot *C* comes in contact with the latch, moving it downward below the stock thickness. At the same time, pilot *C* swings the latch to the left, because of the tapered top, and in a position directly below the stock instead of the slot.

When the ram ascends, the latch comes to rest under the stock. As the stock is moved forward the latch drops into the hole previously pierced. The latch is moved to the far end of the square slot in position for the next operation.

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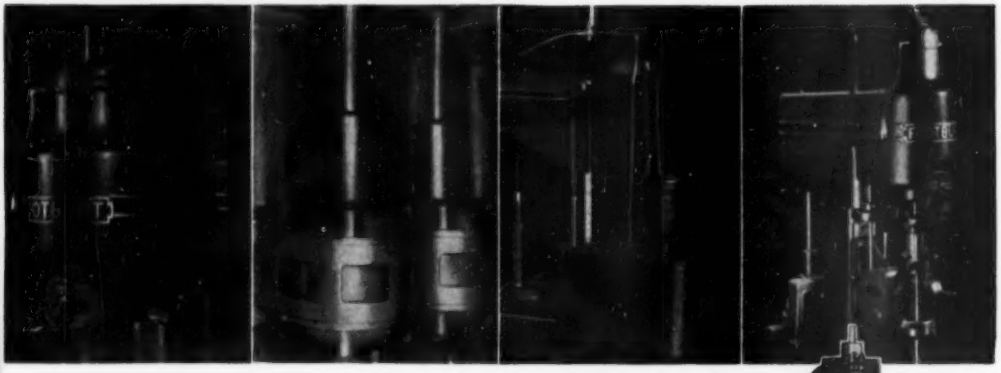

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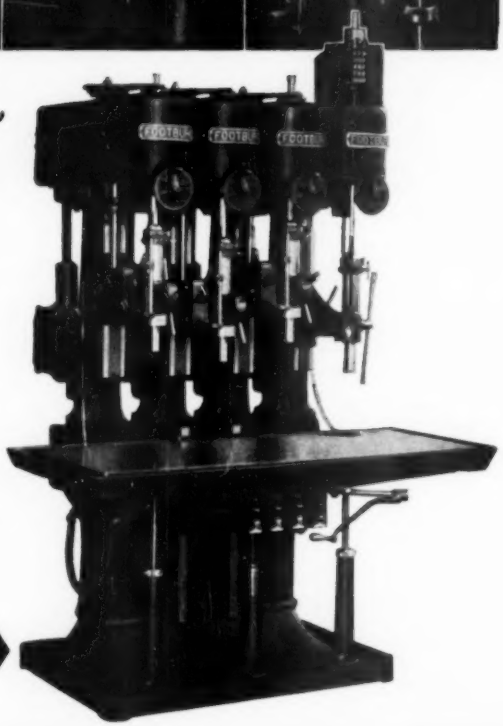

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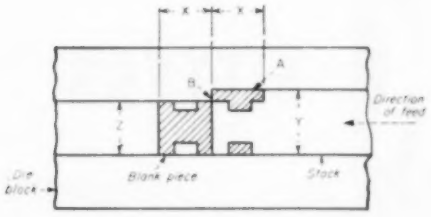
Stops for Dies...II

STOPS FOR PROGRESSIVE DIES *continued*

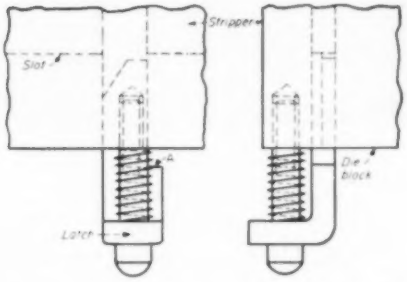


As this stop has no moving parts, it is efficient when several stations in a die are required. However, it has the disadvantage that about 1/16 in. of the stock width is wasted. The stock width is reduced from *Y* to *Z* by blanking out slot *A*. After blanking, the width *Z* remains uniform and therefore no sidewise movement of the stock occurs in the following operations. Distances *X* should be equal. Shoulder *B*, located in the stripper, locates the stock in position.

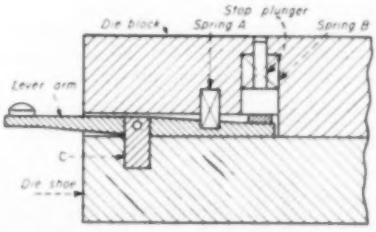
The stop operates as follows: The stock is moved forward against the shoulder *B*, locating the stock in the proper position. Slot *A* is blanked and the width of the stock is reduced from *Y* to *Z*. After the blanking, the punch clears the die, the stock is moved forward the distance *X* and in position for the next operation.

STARTING STOPS

A starting stop is used to position the stock when it is first fed through the die and thus eliminates guesswork. Use of a starting stop cuts down wastage of stock and protects small punches from breaking when piercing or blanking partial sections.



This stop is mounted on the side of the stripper plate. It operates as follows: The latch is pressed towards the center of the die until shoulder *A* contacts the stripper plate. The stock is moved forward against the latch, the press is tripped, and the die performs the first operation. When the latch is released, spring pressure returns the latch to its original position away from the stock. As a rule, this stop is not used again until a new strip is fed through the die.



A starting stop can also operate from the bottom of the die instead of the side. It is mounted between the die shoe and die block, and it consists of the following main parts: A lever arm pivoted on a pin, two springs, and the stop plunger. When pressed downward, the lever arm pivots about insert *C* and raises the stop plunger above the surface of the die block. The stock is moved forward until it touches the stop plunger. After the first operation, the plunger and lever arm are returned to their original position by springs *A* and *B*.

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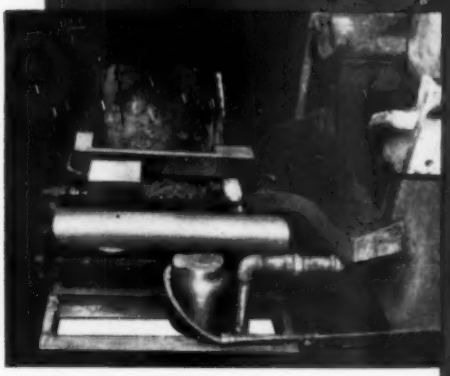

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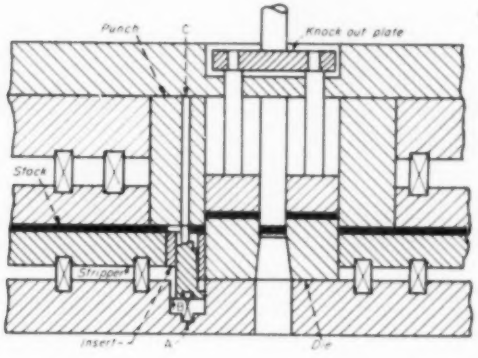
Stops for Dies...III

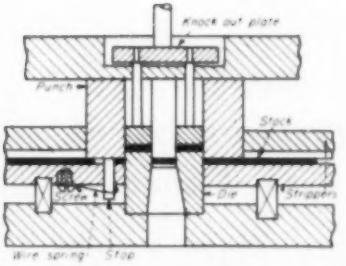
STOPS USED IN COMPOUND DIES

Stops used in compound dies are generally semi-automatic. The stock has to be raised manually over the stop after each stroke of the press.



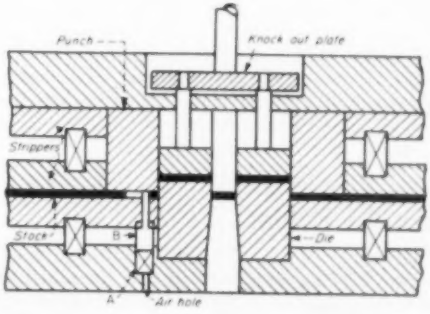
The stop shown is an application of a type previously shown for progressive dies. It has the advantage that the stock can be moved forward and progressively after each stroke of the press without having to raise the stock above the stop. Components are: spring *A*, latch *B* and pilot *C* mounted in the top punch directly above the latch *B*. Latch *B* is square and tapered on one side and top and rides up and down, depending on the movement of the pilot *C*.

The mechanism operates as follows: The stock is moved against latch *B* and placed in position for the operation of the die. When the punch comes in contact with the stock, the pilot comes in contact with the latch, forcing it downward and swinging it to the left under the stock. When the ram ascends, the stop comes to rest under the stock instead of in the blanked hole. As the material is moved forward, the latch drops into the slot, and the stock is moved forward until the far end of the hole comes in contact with the latch. The stock will be in position for the next operation.



A disappearing stop is mounted below the stripper. It consists of a pin that is actuated by a music-wire spring held in place by a screw.

The stop operates as follows: The stock is moved against the pin in position for blanking. When the press comes down, the pin is forced downward by the punch-die, but remains against the stock. When the ram ascends, the pressure in the spring raises the pin just above the stock. The stock must be raised above the pin and moved forward until the pin drops into the hole just blanked, and comes in contact with the far end of the hole.

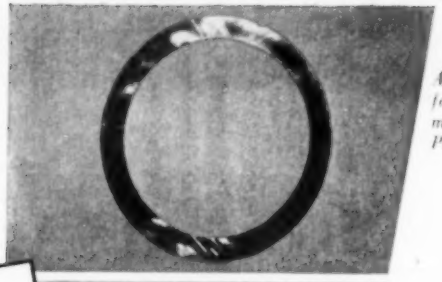


A similar stop is more rigid and is generally used in large compound dies. The stop is mounted between the bottom stripper and the die shoe and it consists of spring *A* and plunger *B*. An air hole located just below the spring *A* allows air to escape during downward motion of the press.

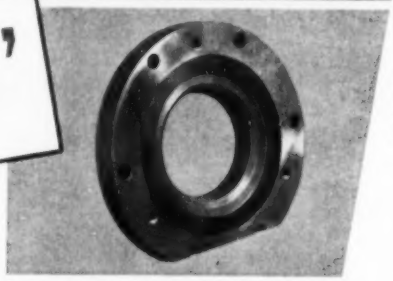
"17-7 PH"

Replaces Carbon Steel In These

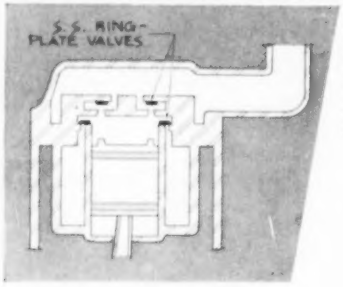
Ring-Plate Valves



A ring-plate type valve for freon compressor made of Armco 17-7 PH Stainless Steel strip.



Here is how the ring-plate type valve is mounted and held in its retaining plate.



This is the way the simple and efficient ring-plate valves operate in the compressor.

In a well-known line of freon compressors, Armco 17-7 PH Stainless Steel has proved its superiority for ring-plate valves and now replaces the carbon steel formerly used.

For these rings Armco 17-7 PH strip, 0.040-inch thick, is purchased in the cold-worked condition. After blanking, only a single low-temperature heat treatment is required for the desired hardness, since cold-working has already transformed the material. Resulting yield and tensile strengths are very high.

This is another case where physical characteristics and low-temperature heat treatment of this precipitation-hardening stainless steel produce a better product in fewer operations. Line check-valve plates and pump-valve discs are among other related applications that have been found most successful.

Two PH Grades

Armco 17-7 PH is made in sheets, strip, plates, bars and wire. Single and double low-temperature heat treatments are employed in hardening. There is also a special bar and wire grade, Armco 17-4 PH, that requires only a single low-temperature heat treatment. If you need good corrosion resistance and high strength combined with ready workability, investigate these two Armco Precipitation-Hardening Stainless Steels. Just a post card will bring you complete information.

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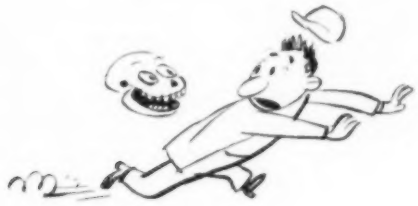


Lost Head

A POWER-TRUCK OPERATOR in the Caterpillar foundry small-molds department, Peoria, Ill., dumped a load of sand on the shakeout screen, as he's done many times before. But this load contained a good-sized clay-like lump. The sand broke away from it —and there, bouncing up and down on the screen, was a human skull! A conference of men in the vicinity resulted in the sending of the skull to Foundry First Aid. But the skull was past that, so it went through channels to the Medical Division. There the doctors decided the problem was not one for medication, but one for investigation, so they turned it over to Plant Protection. There, the skull was found to hold no menace, but some mystery, so it went to the East Peoria police, while one of the men in Purchasing contacted the sand vendor in Ohio about the unexpected dividend.

Said the vendor, "Oh, yes, it happens all the time. Our pit is near an old Indian burial ground, and erosion of the soil moves Indian bones into our pit. Other customers have told us of similar discoveries. It's probably 200 or 300 years old—and you paid for it, so it's yours."

The East Peoria chief of police, not being a head hunter, sent the skull on to Ohio anthropologists and marked the case closed.

But the power-truck operator is still treating each load of sand with respect.

Goodbye Wooden Box

CATERPILLAR TRACTOR has just about completed conversion from wooden tote boxes to steel. Since 1947, the plant has shifted to 104,000 steel boxes, now has only 1200 wooden ones, which are fast disappearing. The steel boxes are really skid boxes, are safer and more durable than their predecessors.

Master List

THE MANAGER of a forthcoming big machine shop is spending sleepless nights looking for a list of "what every new plant's master tool crib should contain." He's asked around and nobody seems to have one. It's easy to figure out what machine tools and accessories and perishable tools are needed. But what of wiping rags, odd sizes of taps and reamers, file backs, feeler gages, miscellaneous wrenches and hammers, chisels, pins, and the dozens of other items that must be there, just in case? The enterprising salesman who brings him a believable list could walk out with an order that might hit $75,000.

Precision Problems

AS WE WORK to closer tolerances we begin to encounter problems in directions previously undreamed of. Hans Lindquist was adjusting a Starrett master precision level on a grinder at Timken Roller Bearing when the level began to act up. The grinder is used on master gages and is mounted in a laboratory with a floor 12 to 18 inches thick and $\frac{3}{4}$ in. insulation to absorb outside vibration. A hurried check of the plant and neighboring industries failed to turn up any reason why the bubble should suddenly jump 0.0014 in. As the grinder had to work to 0.000010 in., this was disturbing. Turned out to have been caused by an earthquake north of Japan, 5000 miles away.

Let Us Spray

UP-AND-COMING USERS instruct operators on large boring mills, planers and other machine tools with carriages or saddles on horizontal rails to wipe the rail clean with rags and re-oil before the carriage or saddle is moved. That reduces danger of scoring and gouging, lengthens accurate life. The usual practice is to use a long-spout oilcan for the re-oiling. But that wastes oil, doesn't spread it well, causes drip onto work, floor, operator, and passersby. So Allis-Chalmers has converted to the inexpensive type of paint-spray gun with a quart-size can attached. It puts a light-mist all over the ways—with no drip, no bother, and no trouble. Saves a lot of SAE 30 oil, too.

Petticoats Are Safe

WESTINGHOUSE, to meet the peculiar needs of the electrical industry for materials that have specified physical properties, plus suitable electrical characteristics, has a sizable Materials Engineering Department. The day when stove iron, paper, silk and shellac were the available materials is gone. Among others, the Lab has developed Discaloy, a high-temperature alloy for turbine parts; Insulfoam, a foaming resin, the "world's lightest solid" and a thermal insulator; and the Magamp selenium rectifiers and magnetic amplifiers, as well as chemicals, paints, cloth, glass, metals, plating compounds, and so on. Nowadays, it isn't a case of "making do;" if you haven't got it, you lay down a set of specs, and somebody invents a new material to suit them. Michael Faraday's wife, if she lived today, could have her silk petticoat back; far better electrical insulation is available.

News of Metalworking

ATOMIC AIRCRAFT TESTS TO START SOON

ARCO, Idaho—Atomic Energy Commission's office in Idaho has notified contractors that plans are available for an assembly area for prototype aircraft-reactor ground testing facilities. Bids will be opened Jan. 5, and construction will start soon after.

NORTHRUP LICENSES PLASTIC-METAL BOND

HAWTHORNE, Calif—Narmco Resins & Coatings Co will manufacture and market an adhesive, developed by Northrup Aircraft, to bond Styrofoam (hard plastic foam material for filling between aircraft control surfaces for extra strength) to metal. The material reduces rivets and structure weight by adding inside strength at a low weight.

PACKARD WILL INTRODUCE PRODUCTION SPORTS MODEL

DALLAS, Tex — A five-passenger, fabric-top car with wire wheels and a look something like the experimental Pan American will be sold in 1953 by Packard Motor Car Co. The sports model will be a regular production item at about $5000.

Military Spending: A Big Load for Secretary Wilson

WASHINGTON—C E Wilson, Ike's Defense - Secretary designate, is scheduled to face some big problems when he takes over Pentagon reins in January. The next eighteen months are perhaps the most critical ones in the arms-buildup program thus far. Reason: Defense contracting is beginning to slack off and drop, and the level-off point will have to be fixed.

This means that, aside from airplanes and other hard-to-get weapons, the large-scale outpouring of defense contracts will slow down. Just how much the Defense Department will cut the flow of contracts is one of the major problems that Wilson will have to decide.

Actually, where the level-off point of the defense build-up will fall to—from a purely military view—is based on two factors: What the ultimate size of the permanent armed force will be as determined by the National Security Council, and what kind of a replacement program for new weapons defense planners figure we should have.

Pentagon experts feel that a return to pre-1950 levels of contracting (less than $10 billion a year) would wipe out post-Korea gains and triple costs within two or three years. It costs just that much to get started all over again.

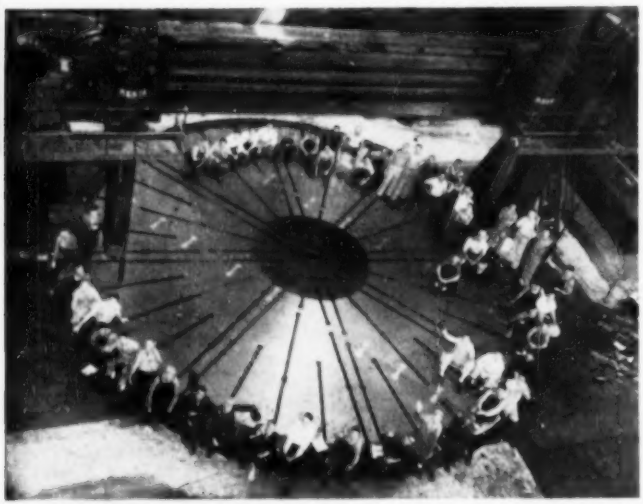
Between WWII and Korea, Congress voted a total of only $50 billion for the entire military establishment. It has taken another $160 billion since Korea to rebuild the U S forces. That is over half the entire U S military appropriations for World War II. Three-fourths of the $160 billion voted thus far has been earmarked for procurement—contracts for hard and soft goods.

Right now, Pentagon chiefs are figuring on an armed force of at least 3.7 million men for the next five to ten years. According to the men who prepare the defense budget, that will cost somewhere between $35 billion and $40 billion a year. Barring further outbreaks of war, that will be the figure the military will ask for in fiscal 1955.

In the meantime, next year's military budget (fiscal 1954), will ease downward toward that level. It's already started to decline from the peak of $63 billion, plus $7 billion in arms aid for fiscal 1952. For the current fiscal year, Congress voted about $50 billion in military appropriations, plus another $4 billion in arms aid.

Preliminary estimates for next year's military budget stack up this way: About $11 billion for the Navy; $13 billion for the Army; and $17 billion for the Air Force. In addition, the Defense Department will ask for $3 billion for military construction. Mutual Security Administration will probably come in with a request for another $6 billion in arms aid, $4.5 billion of which will be bought in the U S. That brings the grand total of military functions for next year to about $50 billion, including foreign arms aid. Of this, some $24-26 billion will go into contracting—including construction and arms assistance to our allies.

What the Pentagon will ask for in the way of new appropriations, however, has little direct bearing on defense spending next year. Reason is that the controlling factor on fiscal



LUNCH ON THE ROUND TABLE is a tryout for Westinghouse's (Sunnyvale, Calif) Mesta horizontal boring mill. Boring table is 38 ft in dia, has 10-ft, 10-in. vertical clearance. Real job in mind is machining air compressor for AF wind tunnel to be installed at Tullahoma, Tenn.

1954 spending is the large backlog of funds which the Defense Department carries on treasury books as "obligated but not expended" funds. That means simply that this money backs up contracts which have yet to be performed.

Last fiscal year—1952—the Defense Department wound up with a credit balance of nearly $60 billion. Congress then voted another $46 billion for direct military appropriations for fiscal 1953. Defense chiefs say that even with expenditures steadily increasing as deliveries of weapons step up, the military will still conclude this fiscal year (next June 30) with a credit balance of nearly $60 billion.

About half the money appropriated for military affairs goes into current costs. It pays salaries and current operating expenses. The balance is for procurement, and in most cases isn't spent for a year or two. Reason is that a contract must be negotiated, work started, and then deliveries begin to roll in before the Defense Department starts writing checks on its contract money. Advance payments, progress payments, and other similar forms of disbursement make up only a small part of procurement funds.

That's why the appropriations for fiscal 1955 will be the key to any leveling off of defense spending. Military money for that year will be financing contracts through fiscal year 1957. Defense chiefs like Air Force procurement boss Roswell L Gilpatric do not foresee any major reduction in arms procurement for the next two or three years. For example: The current aircaft procurement program calls for a peak production of about 1100 planes per month by 1954 and a dropoff to about 400 planes per month by 1956. That would mean a reduction to approximately the same production levels of a year ago.

Congressional pressure has already started to cut deeply into military spending. Congressmen like Representative John Taber of New York, up-coming chairman of the powerful House Appropriations Commimttee, are planning to knock down any big military and foreign-arms-aid budget requests. They eye the backlog of unexpended funds as a huge reserve of military money rather than a fund which is already off-set by firm contracts for weapons.

In anticipation of this, the military has wound up with what they think is their tightest budget request thus far. Pentagon chiefs are unanimous in denying that there is any cushioning allowance for Congressional cutting. In fact, they admit that for certain programs there is no new money planned at all. They are relying on already-financed contracts to carry them through the next year. Other programs, like certain types of tanks, have been stretched out so deliveries will not require heavy financing for another year or more.

AL Opens Research Lab For Metals Investigation

BRACKENRIDGE HEIGHTS, Pa.—Allegheny Ludlum Steel Corp has dedicated and opened its new Vere B Browne Research Laboratory, which consists of two buildings with 19,500 sq ft of area. The large building houses offices, lab rooms, a machine shop, library, boiler room, and other necessities. The smaller has gas manifolds, sandblasting and cutoff equipment, and storage space.

Research investigations will be carried on in corrosion of metals, X-ray, high temperatures, metallography, welding, magnetics, and physical chemistry.

The laboratory will cost more than $500,000, and is the first section of a planned research center. Named after Vere B Brown, pioneer in the development and control of alloy steels, the research center uses stainless-steel curtain walls instead of conventional building materials.

The main building is supplied with forced filtered ventilation, and has controlled-zone heating and plug-in duct electrical wiring.

CALENDAR OF MEETINGS

Jan 8-9—**Midwest Research Institute** (cooperating with local societies), symposium on automatic computing equipment, Kansas City, Mo.

Jan 19-22—**ASME and SAM**, plant-maintenance conference and show, Cleveland Public Auditorium, Cleveland, O.

Jan 21-23—**Society of Plastics Engineers**, annual meeting, Hotel Statler, Boston, Mass.

AEROCAR WON'T GO CAA TESTS ON FLYING AUTOS

LONGVIEW, Wash—Lack of capital has forced Aerocar, Inc, out of the running in Civil Aeronautics Authority full-scale tests of dual-purpose autocars. Big stumbling block was CAA demand for 10 models. Six other companies have been invited to participate. Meanwhile, Aerocar is building four vehicles.

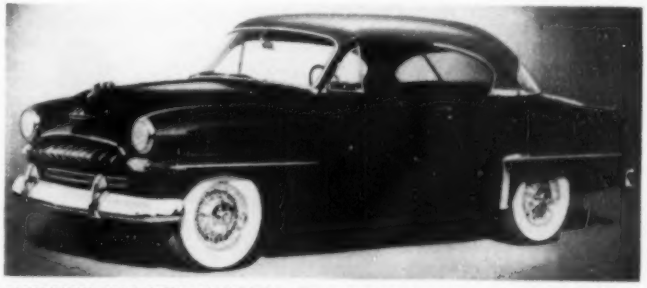
DOW PALLETIZES MAG INGOTS

MIDLAND, Mich—Future shipments of magnesium-alloy ingots from Dow Chemical Co will all be palletized; strapped together for easy handling. No extra costs are involved. Primary-magnesium ingots are available palletized, too, at extra cost.

Palletizing is expected to save materials-handling costs, both at shipping and receiving points.

DOUGLAS A3D PASSES FIRST TESTS

EL SEGUNDO, Calif—The Navy's first swept-wing jet attack aircraft has had its maiden flight and is now in the test-flight stage. It is a twin-engine ship with an internal bomb bay, folding wings and tail, and pressurized cabin for three crew members. It is the Navy's largest bomber for carrier operation.



PLYMOUTH HAS NEW SLICKNESS. Belvedere hard top has wire wheels, plenty of color. Engine is last year's with increased compression ratio (7.1 to 1) and power (100 hp)

Metalworking Abroad

(By McGraw-Hill World News)

Brazil May Ban Motor Imports—up to 65 hp, on the basis that local industry is well able to handle orders. The local assoc of electrical-apparatus makers has recommended further that motors up to 150 hp be banned. Meanwhile, Remington Rand is trying to get permission to start up a typewriter plant in Brazil.

Argentina Aims for 3,500,000 Cars—but is starting up from only 600,000 owned in the country now. Target production of one auto for the year was 5000, which has not been met—and price is $2000.

Japan Sells Engines to Chile—and gets orders totalling $3.9 million. These are for railroad locomotives. Burma intends to order locomotives, railway cars, and coaches from Japan, and may also order inland-waterway passenger ships.

Egypt Will Form Steel Industry—using power from Aswan Dam and ore from upper Egypt. Government funds will take care of 51% of the financing, leaving the rest open for foreign capital. Aim is 150,000 tons yearly to start with.

Germany Will Deliver Tractors to Argentina—under a $20-billion agreement for 10,000 tractors and agricultural equipment. Financial troubles have dogged the deal, but have now been overcome.

Spain to Make Cars—in 1953, shooting at 1500 the first year. Plans are for making bodies in the first four months of the year, engines and gear the next 8 months.

USAF Heavy-Press Program Takes On Firmer Shape

NEW YORK—First of the new presses in the Air Force heavy-press program, the 35,000- and 50,000-ton forging presses that Wyman-Gordon will operate at Grafton, Mass, should be in operation in about a year.

Within two years of going into operation, the 17 forging and extrusion presses now being constructed (see table) will be heavily utilized. The Air Force estimates that by that time the forging presses will be 61% utilized and the extrusion presses 72% utilized.

The entire project should be in operation late in 1954 or early in 1955. Each facility will be completely integrated with furnaces, trim presses, die-making and other machining facilities independent of the basic plants of the operators.

According to Brig Gen Kern Metzger, chief of the Industrial Resources Div, Air Materiel Command, the basis on which the size and number of presses in the program was determined was a survey by the Aircraft Industries Association. This survey came up with 400 parts which could be forged. A group of press operators analyzed the drawings and estimated the size of press required and the production rate that could be attained. From the planned plane-production rate it was then possible to arrive at the number of presses needed in each size.

The program is currently estimated to cost $389 million, of which $210 million has been appropriated. The cost breaks down into $282 million for 20 presses and facilities, and $107 million for supporting equipment.

Three of the 20 presses have been deferred because of insufficient large forging and casting capacity to produce the parts and to have sufficient funds for unforeseen requirements.

Problems have included the impact of the 100,000 tons of steel required for the program. There was inadequate casting capacity in the US and some of the castings are being procured in England, France, and Japan. Forging and machining capacity has been strained and a Navy shipyard has been opened to assist in the machining.

Progress at Wyman-Gordon

The first heavy press, and still the largest, in this country, is the 18,000-ton forging press which Wyman-Gordon was asked to build under Government sponsorship in 1944. This press has been in operation since 1946. Originally planned for experimental and limited-production work, primarily with magnesium, the press has been more extensively used for high-strength aluminum alloys. Recently the press has been utilized at capacity three shifts a day for larger aircraft forgings.

At Grafton, the building housing the 18,000-ton press is being enlarged to include the 50,000-ton "Major" and 35,000-ton "Minor" presses. 7700- and 1500-ton forging presses and several trim presses have already been installed. The enlarged building, being built by Gilbane Building Co, has a high bay 180x750 ft which will house the presses and a low bay 180x750 ft for incoming material and cutting. An additional processing and manufacturing building, 720x720 ft, is being built.

Foundations for the presses will go down 100 ft and the excavation is nearing completion. Floor of the finished pit will be 74 and 67 ft below shop level for the two presses with elevator service to each pit.

In both of the new presses the main hydraulic cylinders will be below the pressbed. The pullback and balancing cylinders will run alongside the laminated columns.

The 50,000-ton press will have a 12x32½-ft die bed area, a maximum daylight of 11 ft 9 in., and a 6-ft stroke, and fast advance and return of 480 ipm. Operating at the same speed, the 35,000-ton press will have a 12x30½-ft die bed area, maximum daylight of 11 ft 9 in., and a 6-ft

NAVY P2V-6 NEPTUNE IS ANTI-SUB SHIP, fitted with turbo-compound engines, radar, pressure-fueling equipment, stainless-steel engine nacelles

PRESENT STATUS OF AIR-FORCE HEAVY-PRESS PROGRAM

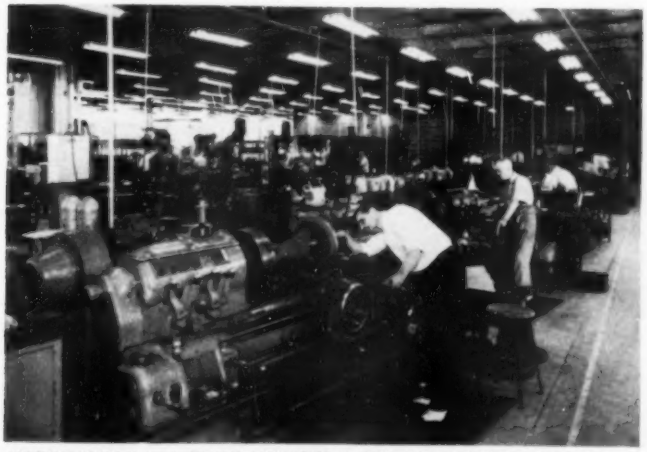
PRESS AND CAPACITY, TONS	OPERATOR	BUILDER
NOW BEING PROCURED		
50,000 forging	Wyman-Gordon	Loewy-Hydropress
35,000 forging	Wyman-Gordon	Loewy-Hydropress
50,000 forging	Alcoa	Mesta
35,000 forging	Alcoa	United
35,000 forging	Harvey	United
25,000 forging	Harvey	Baldwin
35,000 forging	Kaiser	Bliss
25,000 forging	Kaiser	Bliss
20,000 extrusion	Alcoa	Loewy-Hydropress
12,000 extrusion	Alcoa	Schloemann
20,000 extrusion	Harvey	United
8,000 extrusion	Harvey	Loewy-Hydropress
12,000 extrusion	Curtiss-Wright	Loewy-Hydropress
12,000 extrusion	Reynolds	Lombard
8,000 extrusion	Reynolds	Loewy-Hydropress
8,000 extrusion (2)	Kaiser	Loewy-Hydropress
ENGINEERING CONTRACTS ONLY		
75,000 forging		Loewy-Hydropress
25,000 extrusion		Loewy-Hydropress
DEFERRED		
25,000 forging	Dow	
25,000 extrusion	Bohn	
12,000 extrusion	Dow	
EXISTING		
18,000 forging	Wyman-Gordon	Mesta
7,700 forging	Wyman-Gordon	Schloemann
16,500 forging	Alcoa	Schloemann
16,500 forging	Bohn	Loewy
7,700 forging	Bohn	German

NOTE: The above listing includes only equipment larger than 7000 tons. Several smaller forging presses and the accessory trim presses not included.

stroke. The entire die bed of both presses will be a sliding table that will move out one end of the press for accessibility in making die changes.

The single accumulator station for the two presses will have 7 500-hp pumps and 11 accumulator bottles.

Because of the pioneer nature of the Wyman-Gordon installation in the Air Force heavy press program, the Air Force has issued a standing invitation to associated industries to visit the Grafton plant so that experience developed there can be utilized throughout the program.



AIRCO'S UNION, N J, PLANT INCLUDES A GENERAL MACHINE SHOP where standard equipment is employed for short-run items, such as the base casting for a centrifugal pump that handles liquid oxygen, shown on first lathe. High-production items like welding-torch tips and fittings are machined on multiple-spindle automatics in another dept

Airco Moves to Union, N J

UNION, N J—All equipment-manufacturing for Air Reduction Co, formerly carried on at the now-closed Jersey City plant, is being continued at the recently opened plant here. In addition, the equipment-development laboratory has been moved from Murray Hill to Union.

This move exemplifies the growing industrial trend to move from crowded cities to the country.

The single-story 250,000-sq-ft plant, as announced by Scott D Baumer, will turn out roughly 12,000 different items, ranging from welding tips to complete oxygen- and acetylene-generating units.

Community relations are important to the company, as evidenced by a booklet, "Hello, We're Your New Neighbors", distributed to Union citizens to explain the company, what it produces, and giving other general information. Less than 10% of the 1000 employees of the Jersey City plant refused to move to the new location.

TEN BEST ENGINEERING FIELDS NAMED

PITTSBURGH—The November issue of the York Report, published by York Engineering & Construction Co, names the following as the fields of greatest opportunity for America after the defense program has passed its peak:

Fuel from atomic energy, electronic brains, pushbutton factories, engineered homes, television, small cars, new metal processes, rare earths, antibiotics and farm chemicals, plastics.

COMPUTERS ARE NOW REAL DESIGN TOOLS

NEW YORK — Miniature model plants, synthesized with electronic computers, contribute to design investigations to such an extent that engineers cannot now afford to miss their advantages. Design computers combine the speed, accuracy, and versatility of electronics with models of the real production-control systems to be used, as reported by J P Bishop at the annual meeting of American Society of Mechanical Engineers.

Plant Expansions

Rotex Punch Co will move from Oakland to San Leandro, Calif, to take over a new plant where turret punches, small millers, and hydraulic planers will be built.

Simmonds Aerocessories, Inc, will make electronic and mechanical aircraft equipment at a new Vergennes, Vt, plant.

Stronghold Screw Products, Inc, Chicago, has bought an additional plant where nuts, screws, and bolts will be produced.

Thompson Products is refitting a plant at Fruitport, Mich, for the production of ball joints for auto front suspensions.

Triangle Conduit & Cable Co is entering the copper- and brass-tubing field with a new plant at New Brunswick, N J.

Eastern Brass & Copper Co has added a new plant to its existing warehouse and strip-rolling and slitting plant, New York, N Y.

Longren Aircraft Co has just completed doubling plant size at Torrance, Calif, for aircraft parts.

Japan Seeks New Markets For Overaccelerated Economic Capacity

TOKYO — Prices are dropping in Japan, and are now 10% lower than a year and a half ago. This is because Japan's recovery from war devastation has been so successful that production is now too high for what Japan can consume and get rid of in overseas markets. Mining and manufacturing is now 50% over 1950 levels, agriculture, foresting, and fishing are up 10%, and imports have shot up 50%. The total commodity supply is up 30%, while the increased domestic demand is up only 15%.

Although prices have dropped, Japan's price level is still 10% over the international level, so prospects of increasing exports are slim indeed.

Japan's price structure has taken a beating, as can be seen from this table of prices:

Commodity	High	Low	Now
Metal Goods	266.9 (Mar '52)	237.1 (Aug '52)	242.7
Machinery	196.3 (Jan '51)	185.6 ((Sept '52)	185.6
Chemical	132.4 (Jan '51)	111.1 (Sept '52)	111.1
Food	140.6 (Apr '51)	116.8 (Jul '51)	127.5
Average	165.9 (Apr '51)	150.0 (Jun '52)	151.1

All these are levels hit since March '51, with the level of June '50 taken as 100.

Arms Production

A result of this economic situation is increased Japanese desire to manufacture arms—supposedly for the Far-Eastern Command of US Armed Forces. Capacity right now is rated at:

- A million rounds of artillery shells per month after three months of tooling up.
- 809,000 rifle or machine-gun rounds per month.
- 5500 machine guns per month after a year of preparing.
- 9000 rifles per month after six months.
- 933 mortars, 195 anti-tank guns, 70 mountain guns, and 2898 bazookas a month after ten months of work.

Some of the plants ready to start this work would require machine tools and special equipment. Much is made of Japan's industry's willingness to do the work by the Ministry of International Trade and Industry, in their recent estimate of the country's potential.

US to Buy Arms

Already committed is $280 million worth of arms the US will buy from Japan in this fiscal year, mainly for shells, cars, gun parts and ammunition, and particularly repairs on aircraft.

Even though the economic situation is not now healthy, Japan seeks to expand more. Future plans call for four new or reopened blast furnaces, totalling about 2000 tons of pig iron per day. Another less concrete plan is for the recovering aircraft industry to get into the jet-plane market in the next three years.

OVERHEAD MONORAIL SYSTEM at Boeing Airplane Co is being rebuilt to handle greater loads during B-52 production. Boeing is also adding nine 5-ton cranes in final assembly, two 15-ton and two 5-ton cranes in the jib building, and an outdoor 10-ton crane. Expansion of handling equipment will run $650,000

Brazil's Point 4 Will Expand Industry There

RIO DE JANEIRO—A New point-4 agreement between Brazil and the US, just recently announced, provides for technical assistance to small and medium-size Brazilian industries. Main aim is to improve the productive use of equipment and labor so local industry will be better able to meet the demand for basic consumer goods.

Guiding hand in the project will be a technical bureau, called "Service Industrial," under the Brazilian Ministry of Labor, Industry, and Commerce. Contributions will amount to $160,000 by the US and $400,000 by Brazil.

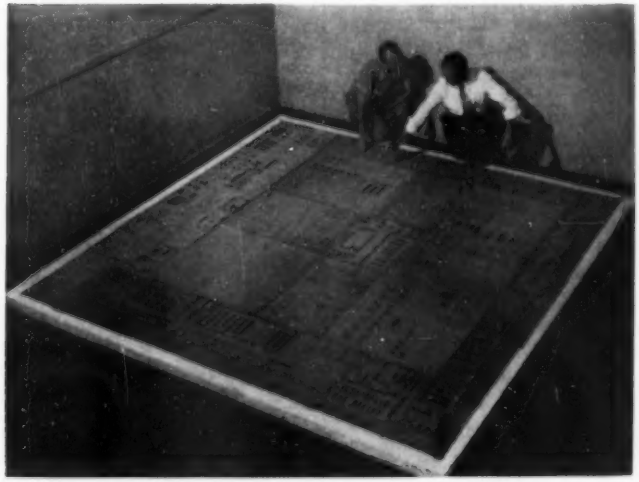
Specialists in modern industrial techniques—plant layout, engineering methods, equipment use, work organization, and materials handling—will demonstrate approved methods in existing plants in Brazil. Brazilian industrial specialists will also be trained in the US to handle problems when they return to their own nation. A clause of the agreement will allow sample products to be sent here for analysis of production possibilities and improvements.

ASA Lauds Batt, Hoagland for Standards Work

NEW YORK—At the 34th annual meeting held at the Waldorf Astoria Hotel, Nov 25, 1952, the American Standards Association awarded its Howard Coonley Medal to William L Batt, retiring U S minister for economic affairs to the UK, and its Standards Medal to Frank O Hoagland, vice president and master mechanic, Pratt & Whitney Div, Niles-Bement-Pond Co.

Mr Hoagland was introduced to the 300 members and guests attending the annual Awards Luncheon by Col Willard Chevalier, executive vice-president, McGraw-Hill Publishing Co. In a brief outline of Mr Hoagland's experience, Col Chevalier stressed the interest he had always shown in the adoption of standards to machine tools and components, and mentioned that it was not unusual for him to adopt an ASA standard as a Pratt & Whitney standard, literally before the ink was dry on the printed sheets.

Mr Batt was introduced by his Purdue classmate, Robert M Gates, president, Air Preheater Corp, who mentioned his leadership in voluntary standards and some of the many honors bestowed upon his friend by the US and various foreign countries.



PLANT-LAYOUT CHECKERBOARD at Northrup Aircraft's Anaheim Div locates each piece of equipment in the shop, and allows tryouts of new methods and production planning. Layout represents T-41 line that makes optical range finders

Distributors Named

A O Smith Corp has added Donie Engineering Sales, Indianapolis, as distributor for safety gratings.

Clark Equipment Co has announced several new dealerships for industrial trucks: Rushmore, Weber, and Case in Albany, N Y; Dempster Bros in Knoxville, Tenn, EquipCo in Miami, Fla; Industrial Truck & Caster Co in New Orleans, La; Furnival Machinery Co in Philadelphia, Pa; Hull Equipment Co in Union, N J; and Lukas Equipment Co in Columbia, S C.

Cleco Div of Reed Roller Bit Co has appointed Electric Tool & Supply Co, Los Angeles; Industrial Supplies Co, Steubenville, Ohio; and Florida Aviation Corp, Miami, Fla, as distributors for their air tools and accessories.

DeBothezat Fans Div, American Machine & Metals, Inc, has appointed Air, Dust, and Fume Control Co, New York, N Y, as suppliers in greater New York and northern New Jersey of industrial ventilating equipment.

Detroit Die Set Corp is represented now in Washington and Oregon by Frank L Shoemaker Co, Seattle, Wash; and in northeastern Ohio by Terry Machinery Co; both handling die sets and accessories.

DeVlieg Mocrobore Co is represented in central and western New York by W S Gallagher Co, Buffalo, N Y, for sales of microboring tools.

Dow Chemical Co has announced Royston Laboratories, Blawnox, Pa, as distributors of their magnesium anodes for underground and underwater protection. Royston also manufactures protective coatings.

Frauenthal Div of Kaydon Engineering Corp has announced the appointment of Neff, Kohlbusch, and Bissell, Chicago, as agents for high-precision grinders in Iowa, Wisconsin, northern Illinois, and northern Indiana.

Gries Reproducer Corp has a representative in Tennessee, Mississippi, and Alabama—C J McAvoy Co, Memphis, Tenn—which will distribute fastening devices and tiny zinc die castings.

Hanna Engineering Wks has added two representatives: Haldeman-Langford of St Paul, Minn, will cover Minnesota and northwestern Wisconsin; and Scott Equipment & Engineering Co, Indianapolis, will cover central and southern Indiana and northern Kentucky. Both distributors will concentrate on air and hydraulic cylinders.

DISTRIBUTORS NAMED

(Continued from p 161)

Hartford Special Machinery Co is represented in central New York by Macauley Machinery Co, which has moved from Schenectady to Rochester.

Jessop Steel Co has appointed Carl E Swift, Los Angeles, Calif, as distributor of specialty tool-steel products.

Lees-Bradner Co is adding three new dealers: Osborne Machinery Co of San Francisco, Swanson Machinery Co of Grand Rapids, Mich, and Klatt & Co of Toledo, O, to distribute and service hobbers and threaders.

Lewis-Shepard has announced that Mussens Canada, Ltd, Montreal, Canada, will represent their line of materials-handling power trucks.

Linatex Corp of America is now represented in the Rocky Mountain area by Howard Toncray, II.

Ludwig Loewe & Co, Berlin, Germany, is represented in this country by Eric R Bachmann, Long Island City, N Y, who will handle their lathes, millers, cutter grinders, honing machines, and optical grinders.

Milford Rivet & Machine Co, formerly known as Pacific Rivet & Machine Co, has added F A Buquoi, Fort Worth, Texas, as representative for fasteners and rivet-setting machines.

Murphy Diesel is now represented in British Columbia by Northern Engine & Equipment Co, Vancouver, B C.

Park Chemical Co has announced A J Mueller as agent for their heat-treat materials in the southeastern states.

Parker Appliance Co has designated Nielsen Hydraulic Equipment, New York, N Y, as distributor of industrial fittings and tube tools, and Ardun Supply Co, Tulsa, Okla, as distributor for the same products in that area.

Polymer Corp of Pennsylvania has appointed W B Conrad, Detroit, as representative for Nylon and Teflon rod, tube, strip, and slabs in Michigan.

Reliance Electric & Engineering Co has announced Smithco Engineering, Tulsa, Okla, as representative for motors and drives in Oklahoma.

Reynolds Metals Co has appointed Barth Smelting Corp, Newark, N J, as distributor of aluminum pig and alloy ingots. R G Stern Co, Reynolds distributor in Los Angeles, has changed its name to Bralco Metal, Inc; and Silverstein & Pinsof, Chicago, has changed its name to SIPI Metals Corp.

Omer E Robbins Co has designated W S Gallagher Co, Buffalo, N Y, as western New York representative for precision angular equipment.

Sintercast Corp of America has announced J W Mull, Jr, Indianapolis, Ind, as sales representatives in Indiana, western Ohio, and northern Kentucky for carbide specialties.

Sub-Zero Products Co has announced five new distributors: Tucker Wilson Co in Roseville, Mich; Tidewater Supply Co in Columbia, S C; Mid-Continent Products Co in Chicago, Ill; O'Toole Dodridge Co in Gardena, Calif; and E & L Metcalf Co, Perth, Western Australia.

Technical Equipment Sales Co is a new outfit headed by E B Andrews and Harry S Robinson in Cincinnati, O, that will distribute machinery, machine tools, and precision measuring instruments in that area.

United States Radiator Corp, Boiler Div, has appointed Fletcher Sales Co in Louisville, Ky, to handle steel boilers in all sizes.

Public Airing For the Paley Report

WASHINGTON — Full-scale public review is due for the Paley report on long-range US materials outlook, isued last June by the President's Materials Policy Commission.

The report concluded that industrial production would be doubled in 25 years, eating up our natural resources at an alarming rate, and it presented a number of controversial recommendations on what to do about the future serious situation.

This week a non-profit research outfit, Resources for the Future, Inc, announced a "citizens' conference" in Washington on March 25-27, at which the Paley Commission proposals and other aspects of natural-resources policy would be hashed out in a big public forum.

White House cooperation is already assured by an Eisenhower OK. Invitations will be sent to about a thousand industrial, farm, and labor leaders, and top government and academic figures in the field of conservation of our natural resources.

The corporation was originally set up as an advisory body to the Ford Foundation, which will presumably pay for its activities in March. Horace M Albright, president of U S Potash Co and onetime director of the National Park Service, is head of the organization. Mr Paley is a member of the group's board of directors.

Other subject matter for the conference includes the two-year-old report on water (President's Water Resources Policy Commission), a forthcoming study on how to put Paley-Report recommendations into effect (by the National Security Resources Board), the Hoover Commission's report on organization of governmental natural-resource agencies, and the "social values" of conservation. A side note on interest in the Paley report is the fact that it is text for a Univeristy of Chicago economics seminar.

NMTBA ISSUES HIGH-SCHOOL INFORMATION BOOKLET

CLEVELAND — A 20-page booklet, "America's Muscles," is being distributed by the National Machine Tool Builders Assoc to children of high-school age for educational purposes; it describes simply the what, why, and how of machine tools and indicates their relation to national production and economy. Copies can be obtained from the association at 10525 Carnegie Ave, Cleveland 6, O.

GRINDING DATA PILES UP

CHICAGO—Research conducted at Mellon Institute sponsored by the Grinding Wheel Institute is providing considerable information that will aid in grinding operations. Included are better techniques for studying residual stresses.

CLAD-METAL PATENT EXCHANGE CREATED

NEW YORK—Alfred P Knapp, pres, Knapp Mills, Inc, has reached agreement with German firms for an exchange of process information in the field of clad metals and equipment. His next try will be England, where he hopes to further the principle of setting up a world-wide exchange of information and ideas.

NMTBA OFFICERS ELECTED RECENTLY AT WHITE SULPHUR SPRINGS, W VA, included Francis J Trecker, pres, Kearney & Trecker Corp—Treasurer; J C Cotner, pres, Hydraulic Press Mfg Co; and Alan C Mattison, pres, Mattison Machine Wks—both elected directors of the assoc. Our story in last issue (*AM*—Nov 24 '52, p 174) just beat our deadline, but these photos didn't—so here they are

NLRB Decision May Lead to Union Influence on Subcontractors

WASHINGTON—Two labor unions can be a lot worse than one—witness the recent case of Anheuser-Busch at St Louis. Here's the situation:

- AFL carpenters and CIO machinists have been fighting in the plant for some time over which union will control millwrights who come in to repair equipment and make additions.
- Carpenters struck in '50 and '51 because AFL unions didn't get millwright work.
- Anheuser-Busch gave written assurance to AFL carpenters that the next contract would not include exclusive right to millwright work for CIO.
- CIO machinists struck to defend their exclusive priority.
- Anheuser-Busch took case to court, charging the CIO strike was a violation of Taft-Hartley clause that forbids striking to force employer to assign particular work to one union rather than another.
- NLRB returned decision saying it was *not* a dispute over work assignment, but was over CIO's demand to limit Anheuser-Busch's selection of subcontractors by terms of a collective-bargaining contract.

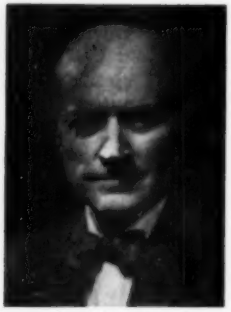
The upshot of the board's decision is that a union may, under Taft-Hartley, force an employer to agree to select only subcontractors having contracts with the same union.

This is a lost round for Anheuser-Busch in the long-time fight with unions, but it is probably not the end of the dispute. This one decision, however, may have far-reaching effect on the construction industries, and perhaps others, to boot.

NEW GRINDING WHEEL INSTITUTE OFFICERS, elected at a meeting in Atlantic City, N J, are (left) Earl C Hughes, vice president of Bay State Abrasive Products Co—Chairman of the Board; talking to him, E Paul Floyd, vice-president of Waltham Grinding Wheel Co—President; (right) Clarence E Etheridge, secretary of Macklin Co—Vice-President of the institute

James S Kirkpatrick

Robert S Sweeney



E C Freeman

Henry H Lentzner

Names in the News

James S Kirkpatrick, director of research and development for Brooks & Perkins, Inc, has been elected president of The Magnesium Association. Under his administration, the assoc will hold an international exhibition in Washington, DC, next spring.

W L Voegeli has been announced as new asst director of engineering, tractor div, Allis-Chalmers Mfg Co, a new position. He has been associated with agricultural and service sections of the firm.

J H Bradley has been appointed vice president in charge of the Chicago office for Holcraft & Co, replacing **C H Martin**, who has been shifted to special assignments because of ill health.

Thomas A Morgan, former president and board chairman of Sperry Corp, has been elected to the board of directors of Pressed Steel Car Co.

H Albers has been promoted to chief engineer in charge of the USAF heavy-press program for Loewy Construction Co, subsidiary of Hydropress, Inc. **G Krause** has been appointed chief designer for Loewy.

Robert S Sweeney has moved up from controller and vice president and treasurer of Watson-Stillman Co to become general manager of the firm, in charge of all manufacturing and sales.

E C Freeman has been appointed factory mgr of Chrysler Corp's Trenton, Mich, plant. His former position was gen'l superintendent of Chrysler's Marine & Industrial Engine Div at Trenton.

Roy A Kropp, president of Kropp Forge Co, has been elected a member of the board of Cenco Corp. He is also president and director of Kropp Steel Co.

Floyd A Garman has been named chief engineer, and **Walter V Magee** has been named asst chief engineer of American Steel & Wire Div, U S Steel. Mr Garman succeeds **Harry L Jenter**, who has been promoted to asst mgr of operations of the Cleveland district.

Arnold K Brown has been re-elected a member of the National Industrial Conference Board. He is executive vp and a director of American Machine & Foundry Co.

Henry H Lentzner, manager of K & T's subcontracting div, has been appointed manager of Kearney & Trecker's special-machinery div which will operate in the new plant being built near Milwaukee. **John P Bunce**, project engineer and priorities coordinator in the firm's sales div, was named his assistant. **Morris L Hutchens**, a field engineer and sales representative, was appointed chief engineer of the new div. New sales mgr for the div is **Harold W Kippers**, former asst sales mgr for the company. **Walter J Hubbes**, mgr of the process engineering dept, has been appointed superintendent of manufacturing operations for the new plant.

Arthur H Beasley has been appointed manager, Memphis sales branch of Wagner Electric Corp, where he succeeds **A Callaway Allen**, now sales mgr of the company's electrical div. Beasley is transferring from the company's Chicago office.

Sigmund Morey, president, Morey Machinery Co, New York City, has become chairman of the board of the firm, and **Leonard Morey**, heretofore vice president, has been made president. These changes are the first major step in a program of expansion which includes the adding of new lines and more personnel to broaden the company's machine-tool coverage. Market development and customer service will be stressed in the enlarged program. Other executive-staff changes include the promotion of **D T Himoff** to vp, **Robert Morey** to vp and secretary, and **Samuel Morey** to treasurer.

G Krause

Leonard Morey

Sigmund Morey

John P Bunce

Morris L Hutchens

Harold W Kippers

Walter J Hubbes

Lawrence Cowen, president of Lionel Corp, has been elected to the board of directors of L E Waterman Co. He also directs Aierx Corp.

F Clark Cahill has been appointed chief engineer of the engineering & production div of Airborne Instruments Laboratory, moving up from the position of supervisor in the radar section of the laboratory's research and engineering div.

N L Hammond, Jr, mgr of tube sales, Peter A Frasse & Co, has been appointed chief, warehouse sect, iron & steel branch of OPS.

F W Gottschling, moving back to Greer Hydraulics, Inc, from Marmon Products and Parker Aircraft Co, will become administrative engineer, assistant to the president of the firm.

Edgar Schmued has been named technical asst to John K Northrup, president of Northrup Aircraft, Inc. He moves from his former position as vp in charge of engineering for The Aircraftsmen Co.

M C Harriman has been named by American Steel & Wire Div, U S Steel, to succeed retiring **John W Patterson** as mgr of merchant products.

Clifford F Hood was elected president of United States Steel Corp, and will also become a member of the board. **Benjamin F Fairless**, who he replaces, will continue as chairman of the board and chief executive officer of the company. **Harvey B Jordan** was elected executive vp-operations of the corporation, and **Walter F Munford** has been appointed president of American Steel & Wire Div.

George Meany, former secretary-treasurer of the American Federation of Labor, has been named president of the union, filling the vacancy caused by the death of **William Green**.

L G Hall, president of Stackpole Carbon Co, has been elected president of National Electric Mfrs Assoc at their annual meeting. He succeeds **J F Lincoln**, president, Lincoln Electric Co.

Victor J Pollack has been appointed controller of Consolidated Engineering Corp. He will be responsible for accounting supervision and office procedure, and will assist the treasurer.

Edward S Russell, president of Consolidated Industries, Inc, has been appointed by NPA to the newly formed Titanium and Fabricators Industries Advisory Committee, which had its first meeting on Nov 24 in Washington.

Leonard H Seeman was appointed asst production mgr, Industrial div, Greer Hydraulics, Inc. He formerly supervised production planning for Greer's aviation div.

Paul Donham has been named president of a newly formed company, Metal Trim Co, Inc, Winchester, Ind. The firm will manufacture decorative metal-trim parts for appliances.

Daniel T Wellman has been appointed president of Wellman Bronze & Aluminum Co, moving from the Cleveland office of Dow Chemical Co.

Dr William H Millett has been transferred from the laboratories of Linde Air Products Co to those of Carbide & Carbon Chemicals Co to work on special products.

B W Kinderman has been elected comptroller of DeWalt, Inc, subsidiary of American Machine & Foundry Co. He will continue in his present position of asst secretary of the firm.

William B Gilmour, mgr of commercial research for Inland Steel Co, has been granted a six-months' leave of absence to serve with the National Production Authority as special assistant to the director of the iron and steel div.

G C Danch has joined Ryan Aeronautical Co to serve as executive asst to Bruce Smith, director of engineering, and will perform special assignments. **Al Deyarmond** has been appointed to fill the post of chief of structures, and will also be chief of aerodynamics. Mr. Danch has been with the Navy Bureau of Aeronautics; Mr Deyarmond with the Air Technical Intelligence Center, Wright-Patterson A F Base.

John G Hoischuh has been named mgr of the newly created market-research section for Elastic Stop Nut Corp of America. He moves from positions in statistics and sales.

(Continued on p 232)

OBITUARIES

Frank J Clark, veteran salesman with Hanson-Van Winkle-Munning Co and leading figure in the electroplating industry, died recently at the age of 72. He was one of the founders of the predecessor of the Metal Finishing Suppliers Assoc.

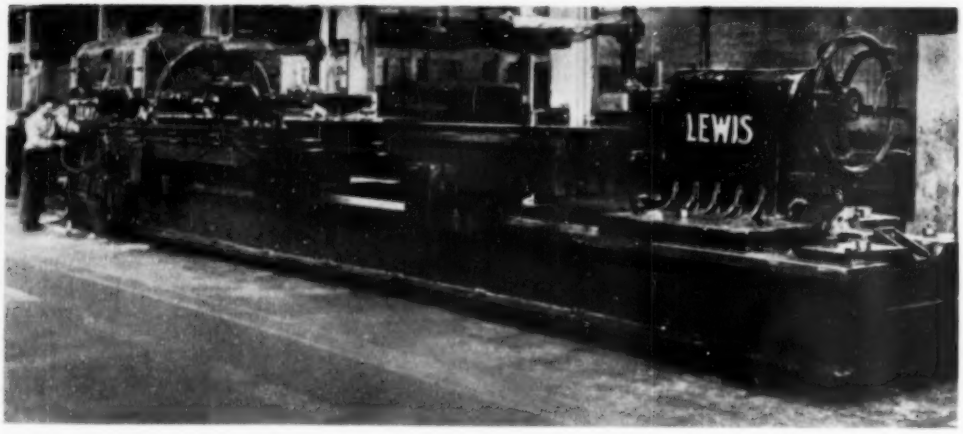
Leopold E Block, one of the founders of Inland Steel Co and vice president of the firm and chairman of the board until 1940, died Nov 11.

Russell S Roeller, general sales mgr of Pennsylvania Salt Mfg Co and a former member of NPA, died Nov 12 after 30 years of service with his firm.

George H Fobian, president of The Oilgear Co, died Nov 4.

Herman Thaler, factory mgr at Micromatic Hone Corp and an employee of the company for 23 years, died Oct 13.

New Shop Equipment



Lewis Hydraulic Lathe Reduces Manual Work

A hydraulic lathe for machining steel rolls is reported to have produced savings in time up to 75% where substantial rough machining is required. The 60-in. machine shown above was built by the Lewis Foundry & Machine Div of Blaw-Knox for U S Steel. This particular model has a 60-hp main drive motor with variable speed from 300 to 1200 rpm. A separate motor is provided for the hydraulic pumps which maintain a hydraulic pressure of 1000 lb in each of the cylinders.

Hydraulic pressure controls the infeed of the tool, the traverse of the tool, and the movement of the tailstock. Moving the tailstock on manual roll lathes normally requires two men and a bar, and may require crane service. Chief saving in time comes from the conversion from a succession of plunge cuts to a single traverse cut.

The width of cut can be increased from a maximum of about 5 in. on manual roll lathes to as much as 8 in. The depth of cut can be increased as much as the tool material will permit because the hydraulic pressure is pre-determined and constant, eliminating wobble.

Hydraulic pressure permits the rough machining of some hard surface rolls that previously had to be ground. It is feasible to operate several cutting tools at once—either on both sides of the roll or at opposite ends.

The roll is supported on adjustable neck bearings, eliminating the weight on the centers. This reduces center wear, provides a truer finish, and reduces the demands on driving equipment.

Lewis Foundry & Machine Div, Blaw-Knox Co, Pittsburgh, Pa.

Low-Priced Lift Truck Handles 1000-lb Loads

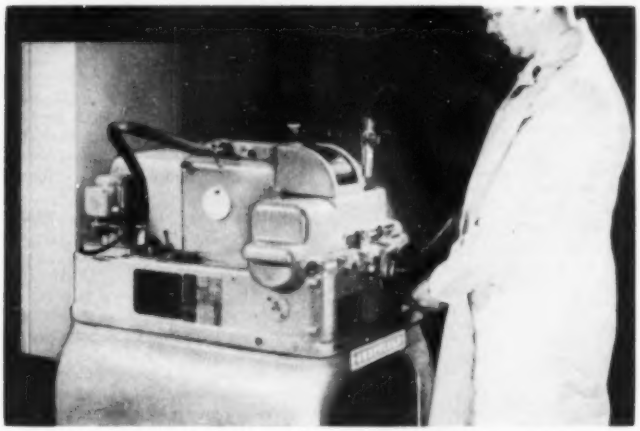
Combination hydraulic-electric lift truck, designed for 1000-lb capacity loads, is being marketed for less than $400.

Century 1000-E's electric lift is actuated by a piston hydraulic pump powered by a 6-v motor; current is supplied by an automotive storage battery equipped with a charger.

Finger-tip electric control raises load from floor level to a height of 4 ft in 15 seconds; small lever releases the 23- by 24-in. material platform for controlled descent, or stops it at any intermediate position. Overall height is 64 in.; base area is 29 in. wide by 34 in. long.

Century Products Co, 5925 Highway 7, Minneapolis 16, Minn

Materials and Parts



Sheffield Small Thread Grinder for Close Tolerances, Fine Pitch Threads

Max thread dia	½ in.
Max work dia	3 in.
Max pitch	20 tpi
Finest pitch	124 tpi
Max helix angle adjustment, right or left	6°

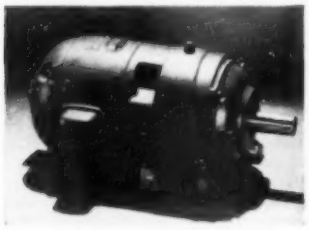
Model 133 thread and form grinder is specifically designed to handle threads 20 pitch and finer. Finest pitch recommended in the US form is 124, though finer pitches can be ground in the Whitworth form.

The machine will handle work to ½-in. dia and 4 in. between centers. It uses a Sheffield multi-rib wheel.

The leadscrew is driven through change gears. It is recommended for such close-tolerance fine-pitch threads as those in precision ground taps, thread-plug gages, micrometer spindles, elevating and adjusting screws, and precision instruments.

The grinder can be equipped with Crushtrue dressing equipment for the grinding of small and intricate forms.

The Sheffield Corp, Dayton 1, Ohio



Three-Piece Gear Motor Cuts Stator Replacement Time

Three-piece unit has been designed to simplify maintenance in case of electrical failure of the stator.

It consists of a Tri-Clad motor, a planetary gear, and a mechanical adapter. Gear is available in speed ratings of 780 to 13.5 rpm. Adapter acts as the pulley end-shield for the motor, motor end-shield of the gear housing, and a mechanical spacer for easy accesibility to the stator frame bolts.

Stator can be changed with the removal of only bearing-enclosure screws, bolts holding the front end-shield to the stator, and bolts holding stator to the motor adapter.

Motor is available in ratings of 1 to 75 hp for standard applications.

General Electric Co. Schenectady 5, NY

... INCLUDING

Disintegrator has large ground workplate to hold large castings, or parts can be on floor..page 169

Center distance gage gives direct reading of center distance between holes.....page 176

Ultrasonic micrometer measures thickness from one side within ½ of 1%.....page 178

Carbide grinding tools have a pressure relief groove that lengthens life.....page 180

Ground flat stock for air hardening maintains accuracy of tools throughout heat treating page 182

Draw-cut shaper machines rectangular tapered openings in forged or cast breech rings....page 184

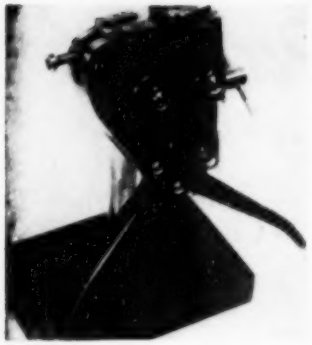
Safety guard for punch presses is adjustable to fit particular setups, tilts to remove damaged blanks.....page 186

Motorized turntable for production lines can be supplied with 6 to 48 positions.....page 188

...and in Dec. 22

Shell centering machine has completely automatic cycle.

Line of crank shapers with single lever to control feed, rapid traverse, and direction of table movement.



Hand tool for butt-welding wires up to 0.070-in. dia. Wire ends are placed through holes provided and knob on right is turned to position them. Handles are squeezed and released to complete the weld

Wire section showing Koldwelded area. Broken end at left is point where wire gave way under tensile test; weld remained firm

Utica Drop Forge Makes Tools For Wire, Sheet Cold Welding

Hand tools for cold pressure welding of such non-ferrous metals as aluminum and copper are being put into production by Utica Drop Forge & Tool Corp. Licenses for the process itself are obtained from Koldweld Corp (AM—Aug 20, 51, p145).

Two tools that operate on the pliers principle, one for wire and one for sheet, are compact, portable tools weighing only a few pounds. A small pocket tool is planned that will be the size of a standard pair of pliers. It is intended for electrical contractors and home owners.

Utica Drop Forge & Tool Corp, Utica, NY

Armstrong Adhesives Require No Heat or Pressure

Epoxy resin adhesives provide permanent attachment for metal, glass, ceramic, wood, plastic, fabric, and hard rubber surfaces. Curing may be accomplished at room temperature, or more rapidly at elevated temperatures to 250 F. Most rigid materials may be bonded to produce shear and tensile strengths in excess of 2500 psi.

In addition to the A-1 grade previously reported (the best grade for mechanical strength in manufacturing assembly) the following grades are now supplied:

A-2 for low electrical resistance and high temperature resistance. Shear and tensile strength equal to A-1, but lower impact strength.

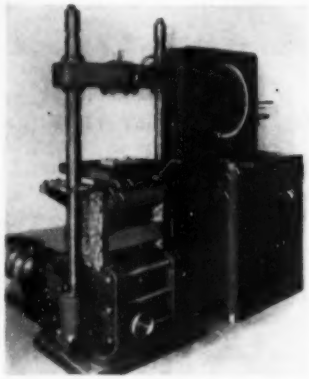
A-3 same properties as A-1, but black rather than reddish brown.

A-4 is aluminum gray in color, with properties similar to A-1. Heavier in viscosity and has greater tackiness.

A-6 is designed to meet Air Force specifications. Aluminum to aluminum is bonded with shear strengths exceeding 3000 psi.

Three activators are available that can be used with any of the adhesives, choice depending on the curing time and temperature desired.

Armstrong Products Co, Box 1, Warsaw, Ind



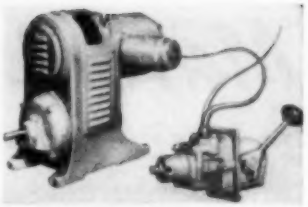
Testing Machine Incorporates Electric Weighing System

This 50,000-lb capacity universal testing machine incorporates an electric weighing system and an electronically-controlled, motor-driven loading mechanism.

Model FGT Baldwin-Emery SR-4 has weighing and measuring tolerances of 0.2% of reading. Loads are measured by means of two SR-4 universal load cells at the base of the two vertical tie rods.

Load system utilizes a single enclosed reversing screw rotated by a 2-hp motor over a speed range of 360 to 1; max stroke is 8 in. Test table is 20-in. square; max vertical space is 24 in. for both tension compression tests.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa



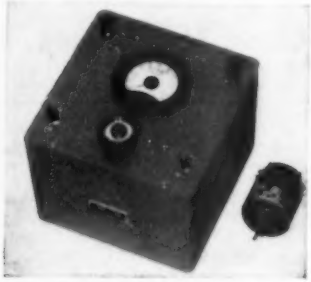
Pneumatic Remote Control For Varidrive Motors

Control consists of a positioning unit—an air-operated plunger attached to the Varidrive speed changing device, and an air valve which remotely controls the positioning unit.

Four types of valves are available: pedal, lever, cam, or wheel; positioning units operate with an air pressure of either 60 or 100 psi.

Through use of check valves and control station selectors in the system, speed of the Varidrive can be changed from any number of control stations, or any number of Varidrives may be controlled by one station, providing they are to operate at the same speeds.

US Electrical Motors, 200 E Slauson Ave, Los Angeles 54, Calif



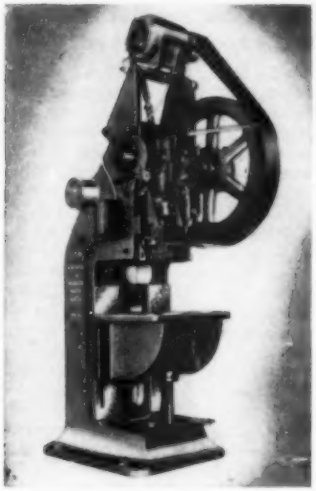
Wide Range Motor Control

Wide range speed and torque generator 302-A consists of a special motor and control box operating from the 117-v, 60-cycle line. Motor speed can be varied from 100 to 10,000 rpm, with a max output torque of 1.0-oz in.

Matching gear boxes are available for any reduction ratio. Motor speed can be controlled remotely, either by a varying dc voltage or a shaft position. Speed is read directly on a front panel meter; provisions are made to measure torque delivered to the load.

Applications include: automatic control systems, light machine tools, industrial process control, servo directors, variable-speed turntables.

Industrial Control Co, Wyandanch, LI, NY

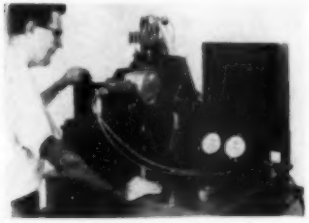


Adjustable Bed Horn Press

This 45-ton horn press, with solid or adjustable bed, has a 2½-in. stroke with max adjustment of 7 in. It is equipped with a 38-in. dia flywheel; bed area is 22½ by 26 in.; distance from center of slide to frame, 12½ in.; between gibs, 11½ in.

All working parts are interchangeable with the manufacturer's No. 550 B press.

Perkins Machine Co, Warren, Mass



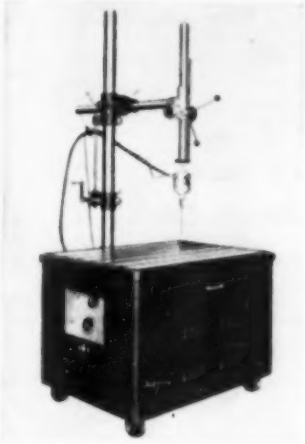
ID, OD Piston Gage Checks All Critical Diameters

A multi-dimension gage has been designed to measure all critical dias of automotive and aircraft pistons in two operations.

With the dual-measuring air plug in a vertical position, operator loads the piston and checks both ends of the wrist pin hole for ID, taper, and bellmouth. Air plug is then rotated 180° to explore for out-of-round and other undesirable hole conditions; slightest variation from a master setting is immediately noted by the Dual Dimensionair.

As gage handle is pushed forward, piston takes a horizontal position between the contacts. Here all OD's are simultaneously inspected for out-of-tolerance by eight floating gage units, and off dimensions are shown on a picture panel. Red lights indicate oversize; amber, undersize. Compact floating units facilitate multiple gaging at very close quarters.

Federal Products Corp, 1144 Eddy St, Providence 1, RI



Broken Tap and Drill Remover Has Extra-Size Workplate

Cutting Speeds:

¼-20 tap broken ⅞ in. to 1 in. deep, removed in	1 minute
½-13 tap broken 1 in. to 1⅛ in.	3 minutes
⅝-11 tap broken 1¼ in. to 2½ in.	5 minutes

Model 1-S metal disintegrator has the largest cast iron T-slotted ground workplate available on this type of equipment—28½ in. by 39½ in. This prevents large castings from hanging over side or end of the machine, and liquid coolant running on the floor.

Castings too large for the workplate can be worked on the floor, or a radial drillpress, by using the auxiliary ground terminal, and chucking the head into the press. Air can be used as a cooling agent where liquid is prohibitive.

A screw-feed is used for working the radial arm up and down the column. Arm is adjustable through 360° in all planes for faster job set-up, and allows disintegrating head to operate at any predetermined compound angle or position.

Head is designed so that arc is made only on the positive peak of the sine wave, insuring max disintegrating power at all times.

Electro Arc Mfg Co, PO Box 448, Ann Arbor, Mich

Contact Gaging Unit Measures Coarse Surface Finishes

Contact gaging fixture is available for measuring work with a coarse surface finish.

Rigid upper part of the fixture, capable of supporting the weight of the workpiece, contains a pneumatic measuring nozzle. Flexible lower part contains nozzle seat. When the work is placed over the end of the plug, the clearance between the nozzle and seat corresponds to the minimum dia of the bore.

For calibration, standard ring gages are used as masters. Dimensions are shown on the calibrated dial of the bourdon tube indicator in the standard gaging stand.

Fixtures are interchangeable in standard Moore pneumatic comparator gage stands.

Moore Products Co, Philadelphia 24, Pa.

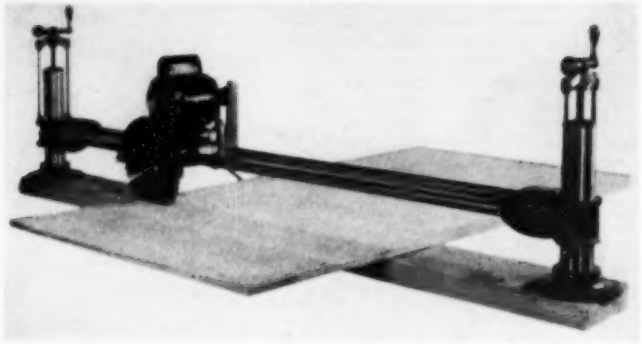
High Gear Ratio Bender For Any Kind of Tubing

Universal tube bender No. 270-F will bend any kind of tubing, including hard drawn copper and hard temper steel. It can be positioned on the tube at any point where a bend is desired, even when one end of tube is connected. Produces right or left-hand, return, offset, and right-angle bends.

High gear ratio facilitates work, especially when using hard temper or large size tubing. Benders can be held by hand, clamped in a vise, or bolted to a bench.

Separate unit is used for each size of tubing, and are available for tubing from ⅜ in. to 1⅛ in. OD (¼ in. to 1 in. nominal size.)

Imperial Brass Mfg Co, 1200 W Harrison St, Chicago 7, Ill



Low-Cost, Long-Railed Saw Handles 4- by 8-ft Sheets Easily

Long-railed, radial-arm saw, model MLR-1, has been designed for cutting of large sheet stock. Available with rails up to 10 ft in length, it can handle 4-ft by 8-ft sheets easily; rails can be tilted from 0 to 90° for mitering or rabbeting. Depth of cut can be controlled by raising and lowering screw jack at each end. Saw is drawn through stock rather than pushing stock across table while being cut.

Unit can be set up for high production output in metalworking with the use of an abrasive wheel.

Basic price is $120 plus $2 per running ft for each rail; ¾-hp electric motor can be supplied, if desired.

Hendrick Mfg Corp, 11 Selman St, Marblehead, Mass

Vise Locates Centers on Runs Within Range of 0 to 4 In.

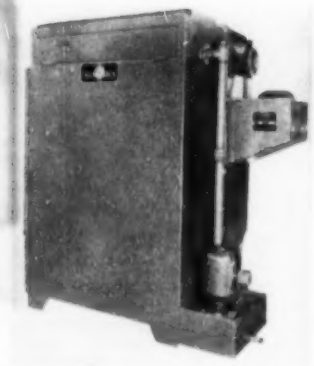
Device for locating centers on runs of pieces of various dias consists of two opposed pneumatic cylinders mounted on a cast iron base, with two master jaws at the ends of rods attached to the pistons. Jaws travel along guides, and movement is mechanically synchronized.

Centr-Finder vise operates on 5- to 100-lb air pressure, depending upon force required at jaws; delivered pressure on the work is the total exerted by both cylinders. Clamping pressures up to 2000 lb may be obtained.

Jaw tolerance from established center line is ± 0.001 in. at any dimension of closing, with a working range of 0 to 4 in. Provided the center of the workpiece is within the range, it is brought within 0.001 in. of the established centerlines, both horizontally and vertically, regardless of dia.

Each jaw is independently adjustable from centerline to accommodate workpieces other than symmetrical; false jaws for specific jobs are readily fitted to master jaws.

Black Drill Co, 1400 E 222nd St, Cleveland, Ohio



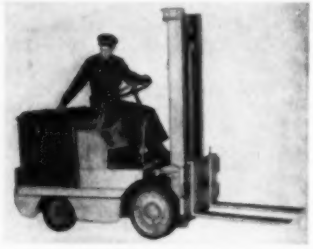
Air-Conditioning Unit Fixes Humidity, Temp, Independently

An apparatus for drying or moistening of atmospheric air, called Liquid Contact Method, treats air to fix relative humidity and temp independently.

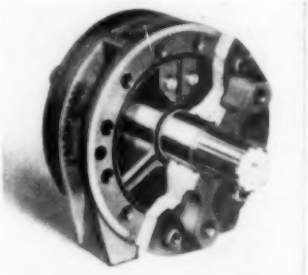
Filtered fresh air enters a spray chamber; spray either adds moisture or removes it by absorption or condensation. Temp or absorbent concentration of the liquid determines moisture content of the air leaving chamber. Final temp is fixed as a separate function, either within or outside the unit, giving thermostatic control without the use of moisture-sensitive instruments.

Moisture-removing spray may be either refrigerated water or the company's Hygrol, a stable organic absorbent liquid, automatically held at proper concentration.

Niagara Blower Co, 405 Lexington Ave, New York 17, NY



Diesel-electric power units are now available for trucks in the 4000-lb fork and up to 10,000-lb platform sizes. Model N, complete with fuel tank and starting battery, fits sitdown units without alterations. — *Ready-Power Co, 3826 Grand River Ave, Detroit 8, Mich*

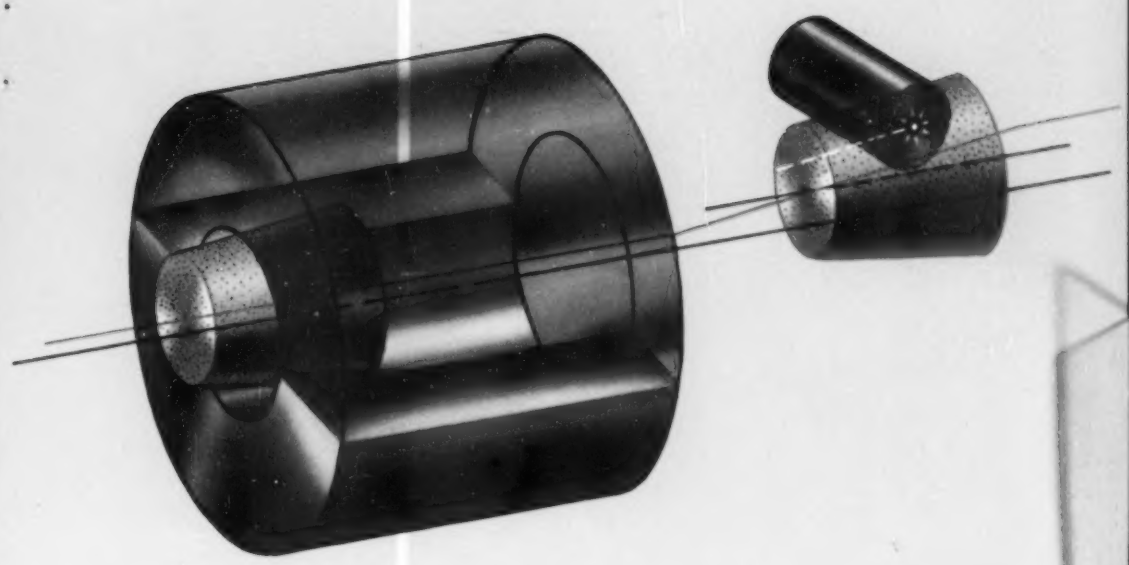


Reciprocating Rotary Actuators Have High Torque Values

A reciprocating rotary actuator employing air, oil, or other fluid medium, the Hydromotor provides equal power in either direction. It can be readily controlled as to speed or arc of travel.

Fully self-contained and sealed, the unit assures complete freedom from dirt and grime. Rotary shaft for connection to load is the only external moving element, and each size in the line has a dual rating. Single vane units, good for a 280° arc of travel, will supply double the torque values when an extra vane is added; a max arc of 100° will serve.

Hydromotor Div, The Bonnot Co, Canton 2, Ohio



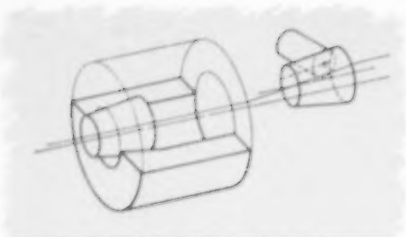
bryant
internal grinding

It is common assumption in internal grinding that once the grinding wheel passes the diamond, all errors will be eliminated and the wheel will be a perfect cylinder. It is also assumed that this grinding wheel can produce a straight hole. These two assumptions are true only if the wheel path is a straight line parallel with the axis of the wheel as it passes the diamond and traverses the work.

In the illustration, the wheel slides are badly worn and the wheel path is not a straight line. The distortion in the ways causes the wheel to move gradually away from the diamond and the wheel is dressed to a taper as it passes the diamond. Then, as the tapered wheel traverses the work, it will grind only on its large diameter. At the point of reversal the tapered form will be transferred to the work. If the traverse stroke is lengthened, the tapered section will be moved to the new point of reversal. In addition, wheel wear will be excessive, finish will be poor, feed lines may be visible.

Available information advises simply turning the workhead or changing the length of traverse to correct taper. In the case illustrated, neither turning the workhead nor changing the length of traverse will produce a straight hole. The only possible remedy is to straighten the wheel slide ways which will, in turn, straighten the wheel path. The wheel will then contact the work properly, producing correct geometry of the hole, longer wheel life and better finish.

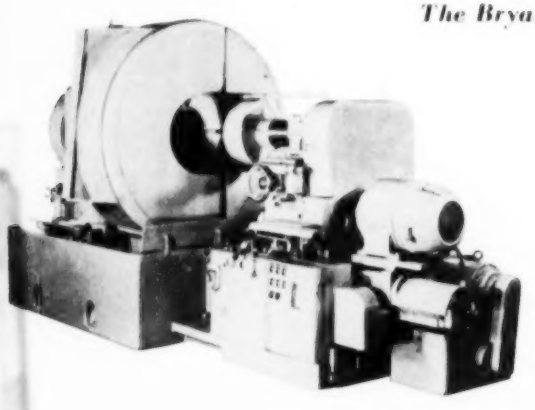
Bryant Chucking Grinder Co. Springfield, Vermont



bryant
internal grinding

Accurate alignment of various machine elements is a basic consideration on even the simplest machine tool. Industry's demand for increased production and accuracy makes the alignment problem more critical than ever before. Bryant machines are designed so that they may be aligned, and this alignment may be maintained throughout the life of the grinder. Alignment and its effect on precision hole grinding is discussed on the preceding page.

The Bryant 1460 Hydraulic Hole Grinder



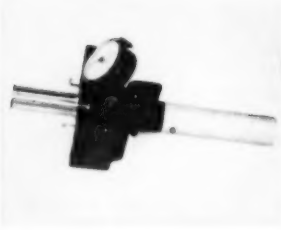
This massive machine will swing work up to 60" diameter. Distance between workhead & front of work slide is 24" minimum and 44" maximum. The workhead will travel 16" forward, or 14" back of machine center to facilitate grinding large bores or faces. The full 60" swing can be had when the workhead is adjusted to 30° for grinding a 60° included angle. Long work may extend back through 9" spindle bore. Hydraulic controls make the 1460 easy and convenient to operate. Write for full information.

Bryant Chucking Grinder Co., Springfield, Vermont, U. S. A.

bryant
thread gaging

Bryant gages are built on the principle of an "expanding" master plug for checking internal parts, or a "contracting" master ring for checking external threads. A dial indicator gives a reading of P.D. which includes variation in thread form and lead. This is an accurate indication of assemblies ability.

The Bryant P-11 Portable Thread Gage



This is basically a split plug gage, equally effective for bench inspection or for gaging internal threads on parts still held in the machine, or in large work that is difficult to move to the inspection department. *4 to 5 times faster than plug gaging!* Standard range is 5/16" to $4\frac{3}{4}$" P.D. Write for catalog describing full line of Bryant Thread Gages.

Here's a Profit Tip from a Turret Drill!

From the experience of Burg Tool Mfg. Co.; makers of the Burgmaster Six Spindle Turret Drill, you may easily derive an idea that can improve your own product and brighten your profit picture.

Burg engineers, incorporating four MICRO precision switches into the Burgmaster's design, achieved a universal type machine which not only boosted production and accuracy, but largely eliminated wasteful handling, which can take up as much as 50% of machining time!

In the Burgmaster, two dustproof MICRO units regulate a motor-and-clutch mechanism into the neutral position needed to provide the correct speed for fast power indexing. Another pair of MICRO switches, regulating the electric clutch, helps preselect the choice of twelve spindle speeds. Result: More efficient, faster drilling operation at lower cost per piece!

According to Mr. J. L. Burg, Vice President, "We chose MICRO switches because of their sturdy construction, adequate overtravel and proved dependability through a countless number of contacts."

If *your* design problem involves precision-switch use, MICRO field engineers will gladly cooperate with you and your design staff to meet your switch requirements.

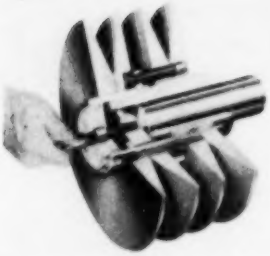
Two MICRO switches (above) actuate motor and clutch to provide correct speed for power indexing when turret head is raised. Two others (lower right) regulate spindle speed as it moves into drilling position.

Let a MICRO Engineer show you how you can "Use MICRO Precision Switches as a principle of good design"

Battery of Burgmaster Turret Drills in operation. Machine at left in drilling position. Next unit shows turret head raised to indexing position.

MICRO
MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS

A DIVISION OF
MINNEAPOLIS-HONEYWELL REGULATOR COMPANY



Taper Lock Bushings On Dodge Variable-Speed Drive

Components of this drive are: (1) a variable pitch motor sheave; (2) a set of wide-range belts; (3) a companion sheave; (4) a slide motor base. The Dodge taper-lock principle is used in the bushings for both sheaves and the drive, enabling speed changes to be made quickly and easily. The variable sheave assembly locks on the motor shaft as a unit with the turn of a screw.

The pitch dia is changed easily by means of a one-point adjustment. The single adjusting screw may be located at either end of the sheave, although normally it is factory-assembled on the motor side. The pitch dia can be set accurately and cylinder speeds held to close limits. The belts are sealed-life belts with an R-section, having deep side walls which help to insure long life. Transverse ribs provide greater lateral rigidity. The belts are oil-proof, heat-resistant, and static-conducting.

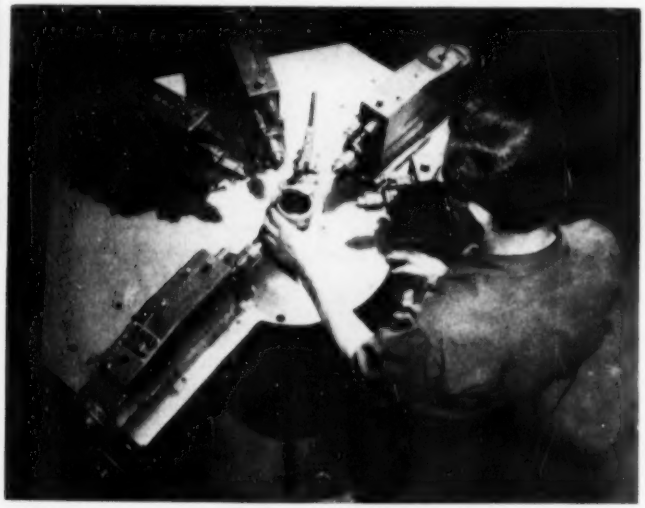
The companion sheave in the drive is factory-balanced and has no projecting parts.

The slide motor base permits changes in center distances to preserve proper belt tension and the variable pitch sheave is adjusted for different speeds. The base is of all-steel construction. A range of centers is provided with the easy turn of one screw. It is compact, of flush design, and is available in a full range of sizes for NEMA frame motors.

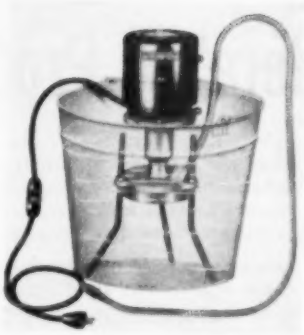
Dodge Mfg Corp, Mishawaka, Ind

Pyrobond adhesive for bonding shell mold halves is applied to mold as a film or liquid; when heat-cured, it bonds securely, eliminating need for clamps or bolts. Adhesives can be applied closely to casting cavities and holds mold evenly; need for shot or silica sand backing is eliminated. Bonding element disappears in the shell reclaiming process, eliminating problem of bolt or clamp removal from molds.

World Bestos, New Castle, Ind



DRILLING AND TAPPING TABLE has five Locke air-opened drilling and tapping units, bezel fixture, fixture clamp, motor support brackets, and pedestal. Each drill unit is powered by a ½-hp electric motor mounted under the table. The operator inserts an aluminum bezel into the fixture, taking care that it is placed properly. He then pulls down the locking clamp. After a solenoid switch in each drill unit is activated, air cylinders build up pressure until each drill head thrusts forward. This forward thrust takes place among the units simultaneously. The five drills enter the fixture drill bushings and drill and countersink the holes.—*Beaver Machine & Tool Company, Inc, Syracuse, N Y*



Complete Coolant System from Pump and Motor Assembly

Simplified, low-cost coolant pump and motor assembly is available, which, when immersed in a pail or other container of coolant, becomes a complete coolant system.

Unit's built-in, high-volume vane pump, driven by a fully sealed 1/30 hp motor, delivers a steady stream of coolant or oil through the 4-ft-long, semi-rigid flexible metal hose, equipped with a variable volume nozzle. Selection of flow from a trickle to full volume can be varied. Hose life is said to be indefinite, as it resists abrasion, scuffing, and is oil- and acid-resistant.

Supporting legs of the unit are threaded to permit height adjustment of pump and motor for container and coolant level; it retails for $34.95.

Factory Tools, Inc, 4706 W Arthington St, Chicago, Ill.

Lightweight Lumarith plastic mask and cotton gauze filter protects nose, lungs, face, and eyes against dusts, chips, and particles in all types of light, non-toxic work. The GS No. 84 mask and shield retails for $7.80 per doz; extra filters are available at $2 per hundred.

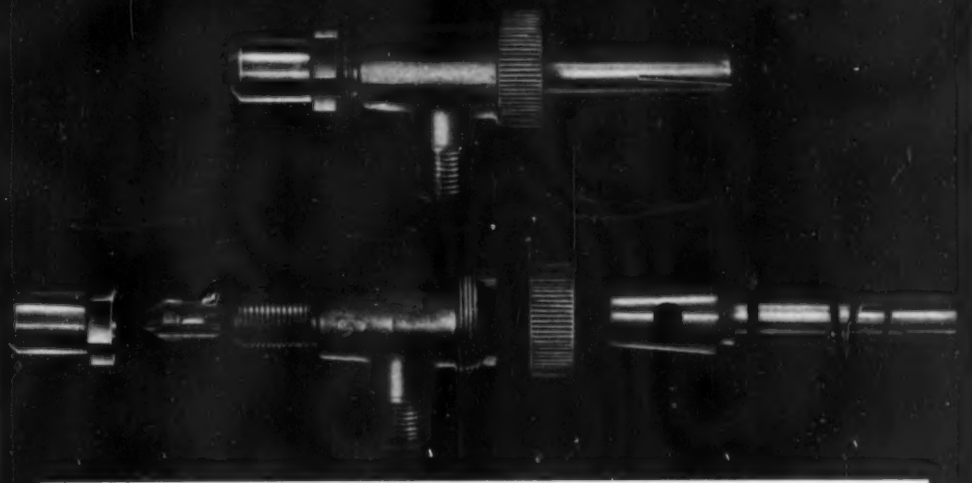
General Scientific Equipment Co, 2700 W Huntingdon St, Philadelphia 32, Pa.

Seamless, deep-drawn aluminum boxes in more than 150 standard sizes are available or can be fabricated to specific requirements and furnished complete with fasteners installed, holes punched, and brackets mounted. Units can be used as instrument dial and gage boxes, precision junction and coil cases, or for various types of electrical and electronic parts.

Zero Mfg Co, 1121 Chestnut St, Burbank, Calif.

LINCOLN FINDS

Brass is Best



Kitchen range burner valve by Lincoln Brass Works, Inc., Detroit 16, Mich. Two different brasses are used in this valve, which is entirely of brass except for the washer and spring. Lincoln also makes valves for heaters and furnaces; flow, drain and shut-off valves for gasoline lines; shut-off valves for agricultural sprayers, and a wide variety of tube and pipe fittings, all entirely or chiefly of free-cutting brass rod and free-machining brass forgings.

Mr. D. E. DuPerow, Vice-President of Lincoln Brass Works, Inc., recently said: "Thirty-six years of brass use by Lincoln and complete acceptance by the trade is the best reason I can think of for brass superiority. If there had been any material better for our purpose, less expensive to fabricate, and more desirable to our customers, we would be using it now."

Brass has many desirable characteristics. Here are five of them that are important in Lincoln valves and fittings: 1, corrosion resistance, which means no plating is required. 2, high speed precision machining for high output, lower costs. 3, sound, non-porous structure of rod and forgings. 4, smooth performance; brass holds lubricants. 5, customer satisfaction; gas range burner valves pass the cycling test of being raised to 425°F. and back to room temperature a minimum of 10,000 times without seizure, loss of free operation, or leakage.

There are many other items besides valves that can profitably make use of the fine qualities of Revere Brass. The Revere Technical Advisory Service will gladly cooperate with manufacturers on the selection of the correct brass and its fabrication. Just call the nearest Revere Sales Office; see your telephone directory. Or write direct.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
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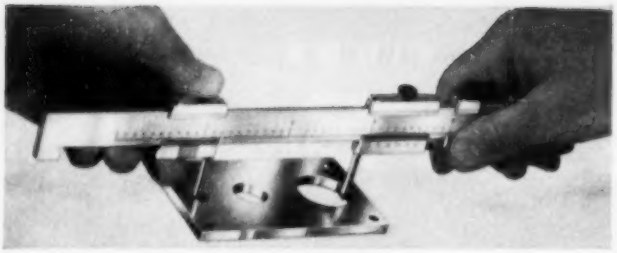


Center Distance Gage Reads Hole Spacing Directly

Center-Mike is a vernier gage and a slide rule combined. Inspectors can measure distance between hole centers quickly and accurately without knowing diameters.

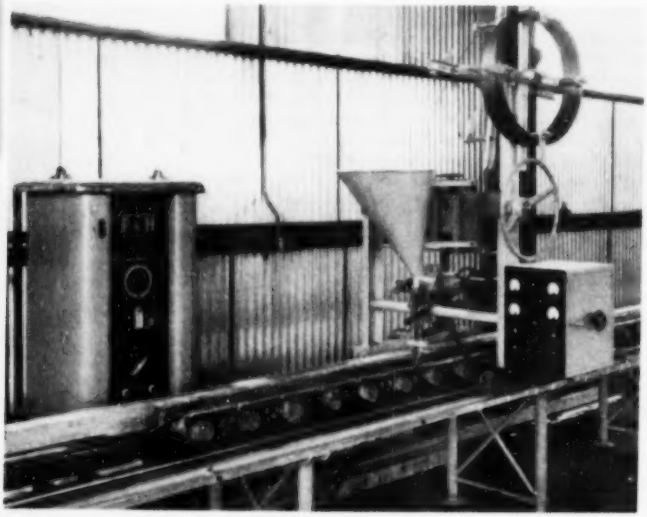
The gage is first set to the closest points on the two holes, then reset to the farthest points on the same holes. The two lengths are registered and their average value computed by the Center-Mike. This value, which is the center distance, appears on a double-size vernier scale. Distance from a hole center to a parallel surface can also be measured.

Three sizes measure from 0.240 in. min. to 4.400, 7.400, and 12.400 in. max. With the standard models, holes must be larger than 0.200 in. dia. Supplementary contacts extend the range down to 0.061 in. dia.

Sorensen Center-Mikes, Inc, 264 Kossuth St, Bridgeport 8, Conn

Homogenous solution Kelite M-2 has been developed to protect mild steel from corrosion after cleaning. Corrosion-inhibiting properties are said to be superior to petroleum oil; it eliminates need for drying prior to treatment, and is impervious to finger printing. Applicable by immersion, spray, or brush. Displaces and absorbs up to 11% of its own volume in water without impairment of efficiency.

Kelite Products, Inc, 1250 N Main St, Los Angeles 12, Calif.



WELDER-POSITIONERS for rebuilding crawler tracks, fabricating, and hard facing. Entire track can be placed on the bed. Welder automatically breaks the arc at each rail joint and restarts on the next link. Positioned bed is 40 ft long, with extra 10-ft sections available. Includes 500-amp welder. — *Dean Weld Machine, Inc, 10154 Edes Ave, Oakland, Calif*

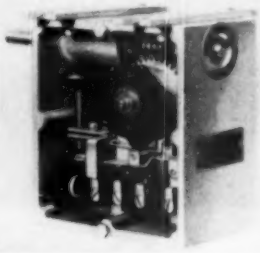
Worm Face Profiled Gear Grinder Wheels

Worm face profiled gear grinder wheels in popular gradings and pitches are being marketed by Jerpbak-Bayless Co. Wheels are accurately formed with proper root clearances, minimizing root crushing; they require minimum dressing. Unit is readily remounted on machine because worm form profile is held square and parallel with the bore and face.

Each wheel is marked with proper pitch and form for quick identification. Plain face or blank wheels for quick service on special pitches and forms are also available.

Distributed by:

Crown Tool & Supply Co, 155 Bell St, Chagrin Falls, Ohio



Rotating Limit Switch

Travel of rotating parts of machines or equipment is controlled by rotating limit switch. It coordinates reversing operations with the rotation of motor shaft to break contact, timing of which is governed by a preset number of shaft revolutions.

Separate switching units have cams engaged with contact arms to open or close a circuit for each end of travel. Suitable for electrically operated doors, hoists, and valves.

Furnas Electric Co, 1044 McKee St, Batavia, Ill

Rubber-cushioned abrasives for burring, finishing, cleaning, and polishing are available in the Brightboy kit assortment #80A. The small wheels and cylinders, totaling 44 pieces in sizes most frequently used with light power equipment, including a chuck and mandrel, retail for $3.60. Special surfacing effects can be obtained by regulating the speed of the machine and/or the pressure on the product which is being finished.

Brightboy Industrial Div, Weldon Roberts Rubber Co, Sixth Ave and N 13th St, Newark 7, NJ

A Delta Carbide Tool Grinder *stationed at the tool* keeps tool bits sharp—reduces "down-time", boosts output.

Put DELTA TOOL GRINDERS Beside Production Machines and Cut Down-Time

How Edward Valves, Inc. does it—

Delta Tool Grinders permanently located along side of automatic screw machines, engine lathes, boring mills and turret lathes, enable Edward Valves machine operators to keep tool points constantly sharp.

Benefits: *less down-time, piece-rate operators have incentive to keep tools sharp, no time wasted between production machines and tool-sharpening room, smaller inventories of cutting tools, fewer tool replacements.*

Another Delta Grinder serves as a "utility man"—mounted on a skid, it is moved by lift truck from one machine to another or to other departments, wherever the pressure is on; plugs into the regular 110-volt lighting circuit; is used for deburring in addition to tool sharpening.

More Delta Tool Grinders are used in the tool sharpening room: and still others in the tool room for new tool production. This kind of production common-sense suggests that the same substantial savings may easily be yours for the taking. Why not survey your own tool-sharpening practices? A good first step is to contact your Delta dealer—he's a trained counselor on just such problems. Call him now.

There's a Delta Power Tool for Your Job— WOOD OR METAL WORKING — 53 Machines — 246 Models — More than 1300 Accessories

DELTA MILWAUKEE

DELTA POWER TOOLS Another Rockwell Product

Rockwell DELTA POWER TOOL DIVISION MANUFACTURING COMPANY

618P NORTH LEXINGTON AVENUE • PITTSBURGH 8, PENNSYLVANIA

Lighter Weight Forklift Has Increased Hp

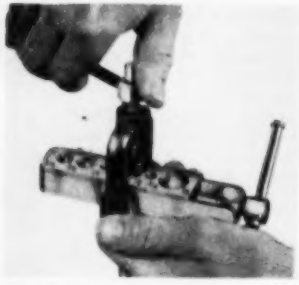
Principal features of the improved Yardlift-150 pneumatic-tired forklift truck of 15,000-lb capacity, are increased hp, lighter weight, and better hydraulic steering.

A new power plant develops more hp at fewer rpm. Weight reduction of 2300 lb provides increased flotation. Improved hydraulic steering makes operation easier for driver; in the event of motor stoppage, steering can be accomplished mechanically.

A pivot-type steering axle is standard on the new Yardlift-150, permitting constant wheel contact during travel over uneven surfaces.

New fork bars are narrowed vertically to help increase driver vision, and the opening between upright channels and lift cylinders has been increased by 3½ in. New upright, made from rolled steel sections, practically eliminates the possibility of twisting or spreading.

Clark Equipment Co., Industrial Truck Div. Battle Creek, Mich.



New Tools Flare Wide Range of Tubing Sizes

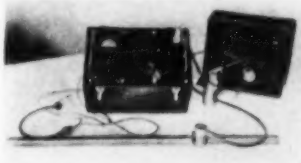
Two new tools for making 37° flares on soft steel, copper, aluminum, and fully annealed stainless steel tubing are available.

One of the features of the new units is that a wide range of sizes of tubing can be flared with a single, compact, lightweight tool. No. 437-F flares 6 sizes of tubing: 3/16", ¼", 5/16", ⅜", ½", and ⅝" OD. No. 537-F has rollers in the flaring cone which facilitate flaring of larger sizes of tubing: ¾", ⅞", 1", and 1¼" OD. It also embodies an automatic burnishing mechanism which provides a highly polished finish to the face of the flare after it is formed.

Tools have a new type of die holder with heat-treated, sliding dies for clamping the tubing. Single lever at the end of the die holder provides for quickly clamping the tubing in place.

Yoke of the tool slides directly over the end of the die holder into position over the tubing to be flared, which makes it possible to operate the tool with exceptional speed.

Imperial Brass Mfg Co. 1200 West Harrison St. Chicago 7, Ill.



Ultrasonic Micrometer for High-Precision Measurements

Measurements within ½ of 1% of actual thickness have been obtained from one side of smooth-surfaced materials with the Audigage ultrasonic micrometer. Device can be used on steel, brass, aluminum, copper, glass, and other dense substances capable of transmitting the ultrasonic waves generated by a vibrating crystal.

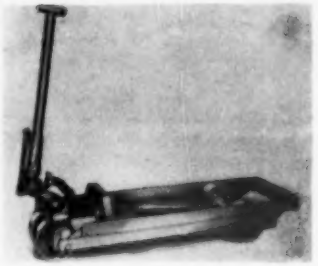
Unit measures thickness by determining frequency at which resonance of the high-frequency sound waves occurs in the material being tested. Resonance is indicated by max deflection of a meter and max strength of a tone audible in the headphones.

The micrometer is designed to operate with high precision over an infinite series of narrow thickness ranges between 0.010 in. and 12 in.

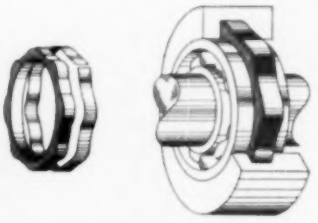
Uses include high-precision gaging of manufactured parts, eccentricity measurements on tubular products, precise determination of corrosion rates in pilot plants, etc.

23-lb unit can be furnished for operation either on its own self-contained power supply, or on 90-115 v, 60-c power from the mains.

Branson Instruments, Inc. 450 Fairfield Ave. Stamford, Conn.



LIFT TRUCK has standard heights lowered of 6, 7, 9, and 11 in. Lift is 1⅝ to 2¼ in. Handle is free of the lifting mechanism when operator pulls the truck. Capacity: 2500, 3500, and 5000 lb. — *Lift Trucks Inc, 2423 Spring Grove Ave, Cincinnati 14, Ohio*



Device Prevents Outer Bearing Race Creep and Spinning

An anti-rotation device, composed of a waved steel spring and a molded rubber ring, has been designed to prevent outer race rotation of a floating bearing and eliminate resultant damage.

Said to be equally effective in aircraft accessories, high-speed hand tools, electric motors, and other power tools, the device is available for use with most popular-sized mm bearings.

Scintilla Magneto Div, Bendix Aviation Corp, Sidney, NY.

Overhead chain conveyor has short radius curves and track sections easily combined so that quick changes or additions can be made. Handles loads up to 30 lbs on each pendant spaced at 6-in. intervals, or 60-lb loads at 12-in. when supported by two pendants fitted with crossbar attachment. Instant adjustment of speeds of from 3 to 9 fpm while Chainveyor is in operation is accomplished by varispeed drive. Track is 1⅜ in. by ⅛ in. slotted tubing which requires minimum support and results in drastic reduction of tract weight for a given load.

US Spring & Bumper Co. 4951 Alcoa St, Los Angeles 11, Calif.

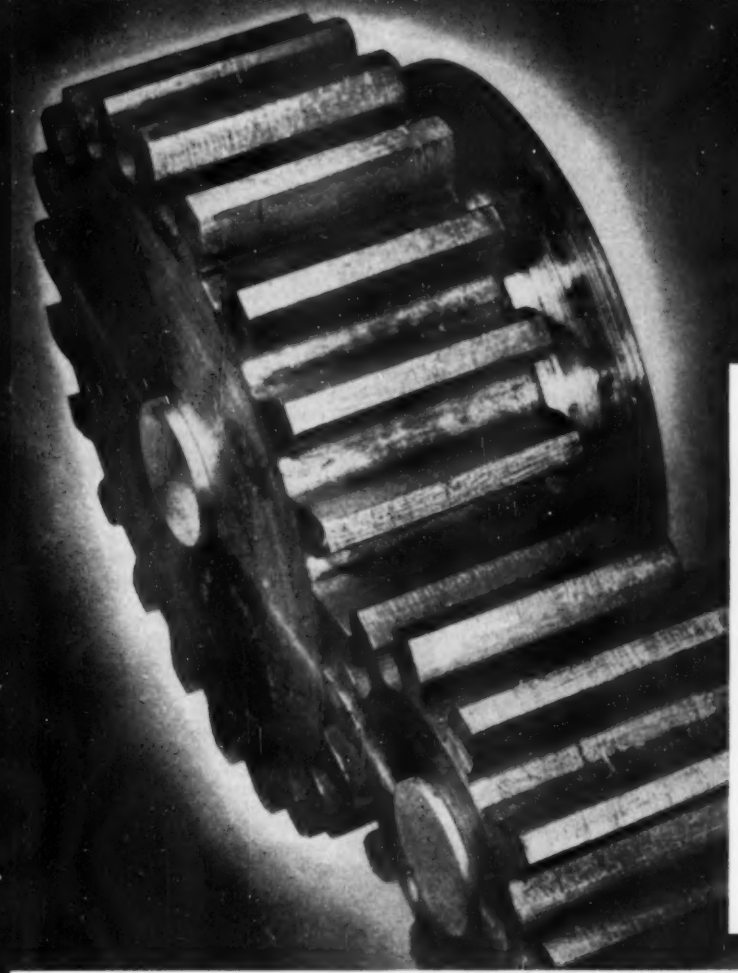
No Pressure Wipe-Off on Gears Lubricated with Sun 897 Grease

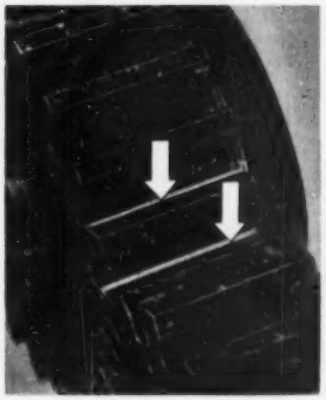
Even heavy tooth loading won't cause Sun 897 Adhesive Pressure Grease to squeeze out. It stays on the gears, prevents metal to metal contact, prolongs gear life, and reduces lubrication costs. Sun 897 is most valuable where *throw-off* with resultant wear and spotting of products must be avoided. It is easily applied with a brush on open gears, sprockets, chains, slides, cams, cables, couplings and linkages. For complete information, consult your nearest Sun representative or write Department AM-12.

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY • PHILADELPHIA 3, PA.
SUN OIL COMPANY, LTD. • TORONTO & MONTREAL

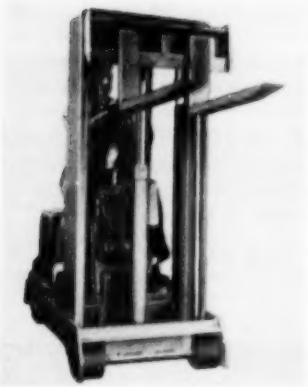
SUNOCO





BLACK GEAR COMPOUNDS oxidize, harden and wipe off quickly under pressure. Arrows indicate where wipe-off of the compound has left the gears unprotected by a lubricant. Metal to metal contact causes excessive wear and thus materially shortens the life of gears.

NO SQUEEZE-OUT due to pressure. A thin, transparent film of Sun 897 Adhesive Pressure Grease stays evenly distributed on the gears and gives positive lubrication at all times. Sun 897 is water resistant and can be easily applied with a brush.



Non-Telescopic Fork Truck Equipped With 1-hp Motor

Non-telescopic fork truck with a maximum lifting height of 56 in. combines two new features with the specifications of the Marforge ¾ hp. New unit retains the interchangeable-power-unit feature of the Load-Mobile line. The 1-hp motor and non-telescopic lift are additions.

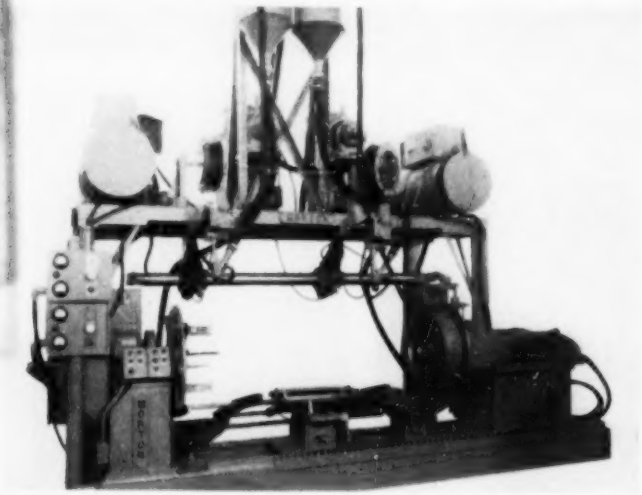
Operation is simplified by the use of one foot pedal to control both high and low speeds in forward and reverse. Stabilizing spring-mounted casters prevent swaying on high-speed turns. The 10½-in. diameter by 7 in. face drive wheel is designed for easy rolling and high traction. Sharp turning is assured by the high gear reduction steering unit and simple three-wheel running gear.

No-load climbing power is approximately 10°, with full load 5°. Maximum speeds with the 1 hp. are up 25% to approximately 4½ mph with no load, 3¾ mph with full load.

Non-telescopic mast has a forward tilt of 5°, backward 10°. Raising, lowering and tilting is by means of levers operating hydraulic valves. Lifting speed is 30 fpm, lowering speed a maximum of 60 fpm. This new power model has a load capacity of 2000 lb at 15 in. from the face of the fork, and other load centers are available.

Breaking strength of the heavy-duty lifting chain is eight times load specifications; a 20% overload capacity is allowed. Power is provided by a 340 amp or 385 amp battery in a choice of lead or alkaline types.

Market Forge Co, Everett, Mass



MODEL E PRESS AND GIRTH WELDER is designed to make fillet and burn-through circumferential welds. It has a built-in, 5-ton hydraulic press for the assembly of parts prior to welding. A two-pressure hydraulic system is incorporated with high pressure for assembly and low for holding parts during welding. Stationary headstock supports the center spindle drive and gives reaction to the press, while the adjustable tailstock houses the hydraulic press cylinder. Press is under pushbutton inching control, and the eject and reload cycle is automatic. Manual longitudinal and radial positioning of the welding heads is provided to cover the machine range. Unit has a capacity 9 in. to 24 in., 12 in. to 36 in., or 18 in. to 48 in. dia and up to 96 in. long. — *Morton Mfg Co, Broadway and Hoyt, Muskegon Heights, Mich*

High Speed Roller Gear Drive

This roller gear drive, a highly improved indexing or intermittent motion mechanism, permits high-speed precision, design versatility, and low maintenance on any application such as indexing dials, carriers, conveyors and indexing mechanisms. It has been used on dials and roll feeds, carrier chains and conveyors at speeds up to 800 pieces per minute to extremely close tolerances and without auxiliary locating mechanisms.

Tests have demonstrated that the drive will operate 8000 hrs when extreme precision is required, without maintenance. Where such precision is not required, the drive operates up to 20,000 hrs without maintenance. Even after such long use the unit can be renewed merely by replacement of standard ball bearings.

It can be used for punch press dials with a precision of plus or minus 0.001 for 12-in. dia dials.

Roller gear drives are custom designed with any number of stops from two to infinity. Indexing period, an entirely separate consideration, may vary from 25% to 100% of the total cycle time—either right- or left-hand rotation is obtainable.

Roller Gear Div, Ferguson Machine & Tool Co, Inc, 471 Paul Ave, Ferguson 21, Mo

Pressure Relief Groove for Carbide Grinding Tools

This pressure relief groove, added to solid tungsten carbide internal grinding or cutting tools, lengthens life of these tools by relieving the pressure which constantly builds up in operating a tool at high speed. It thus reduces the possibility of breakage of the cutting edges of the tool; it also affords greater chip clearance. This cut may be applied to all ID carbide tools.

R L Schmitt Co, 6536 Roosevelt, Allen Park, Mich

The Greatest Advancement in D.C. Welding!

THE NEW A.O.Smith RECTIFIER

OUTPERFORMS ANY MOTOR GENERATOR SET MADE!

No moving parts to wear out. No brushes and bearings to replace. No commutator to corrode or turn down . . . maintenance expense practically eliminated.

Instant striking and smoother arc! There's no inductive time lag usually found in motor generator sets.

OUTPERFORMS ANY OTHER RECTIFIER MADE!

Eliminates stack failure. High-velocity, down-draft ventilation provides plenty of cooling air within the machine. There's no need for thermostatic protection, no interruptions because of current cut out! Even when short circuited while set at rated output, rectifier-stack temperature rise is held below critical levels!

Eliminates machine noise and current creep. No large magnetic forces develop to cause vibration or tear the machine apart, thanks to its moving-coil design. And positive air separation between primary and secondary coils guards against insulation failure which otherwise might put line voltage on welding leads.

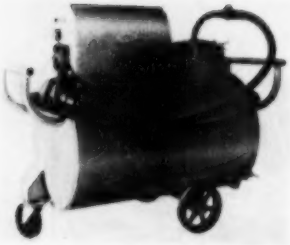
If your jobs call for DC welding . . . you'll weld faster, better, at *less* cost with this new A. O. Smith D. C. rectifier welder—an entirely new concept in D. C. production welding!

For complete information and name of nearest distributor or A. O. Smith representative, write:

A. O. SMITH CORPORATION
WELDING PRODUCTS DIVISION
Dept. AM-1252, Milwaukee 1, Wisconsin
International Division: P. O. Box 2023 Milwaukee 1, Wisconsin, U. S. A.

A.O.Smith
WELDING PRODUCTS

Made by Welders . . . for Welders



Sump Tank Cleaner Operates On High-Vacuum Principle

Sump tank cleaning machine, designated Model No. 20-T, series NA, operates on a high vacuum principle so that nothing but air passes through the pump unit.

Available in capacities of 100-, 150-, or 200-gal. capacity, each tank is fitted with a sludge compartment containing a removable 100-lb capacity basket lined with a replaceable fabric filter bag which retains solids, such as chips, sludge, etc; clear oil or coolant collects in the storage tank.

Pumping unit consists of a vacuum pump driven by a ½-hp motor; it has full automatic controls which shut unit off when tank becomes filled. To discharge tank contents, control lever is shifted from pump to discharge; air pressure empties the tank.

Unit has a pumping rate of 25 to 30 gal. per minute on the average oil or coolant; 20-ft neoprene suction hose with nozzle and filter bag is standard equipment.

W. R. Carnes Co, Verona, Wis.

Modification of the chilling chamber of the Sub-Zero line of industrial chilling machines effects complete circulation of the convection fluid in the chamber six times per minute, resulting in maximum heat transfer. A 3-blade, 4-in. propeller mixer is enclosed in an 8-in. draft tube, with a 6½-in. clearance at bottom and a minimum of 2-in. clearance between top of tube and fluid level. Fillet is mounted in the bottom corner to direct flow of the fluid across bottom of the chamber. Mixer, mounted in the left rear corner of the chamber, is powered by an external top-mounted motor. Modification is available on special size units and on standard R-120 model, which has a thermal capacity of 2000 Btu's per hr.

S C Barer Co, 1600 Times-Star Tower, Cincinnati 2, Ohio

Model HT-2 is a portable electric oven for high temp processing. Equipped with Inconel sheathed sealed tubular heating element for greater efficiency, the unit features a thermostat control with temp range of 300 to 1000 F. Two or more ovens can be used in a group, as they are nest-constructed; individual banked units may be cut out, or operated at different temps. Construction details include fibreglass insulation, double doors for sealing in heat, drip pan, lower shelf, pilot light and outside thermometer. Size is 30 in. wide x 25 in. deep x 24 in. high. 220 v, single-phase motor is standard.

Grieve-Hendry Co, Inc, Chicago 22, Ill.

Permanent Filtering Element Filters Oil Six Times Faster

Oil filter, known as Filterall, features a permanent filtering element which completely eliminates the need for cartridge pack replacements.

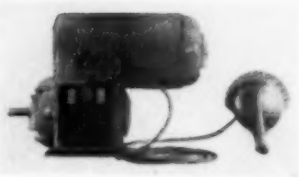
Oil is neither lost through absorption nor slowed up through the filtering element, which is constructed of carefully sized, spherical-shaped bronze particles fused together where they touch. This provides a porous structure which allows 100% of the oil to filter six times faster than ordinarily. Foreign matter, even as minute as 5 microns, however, is prevented from remaining in the oil.

Unit operates with full efficiency as soon as the pump starts.

Permanent Filter Corp, 2309 Riverside Drive, Los Angeles 39, Calif.

Jet black finish for iron and steel, said to have ten times the corrosion resistance of conventional blacks, is available under the tradename Parco Black. Parts to be treated are immersed for 15 to 30 minutes in the processing bath, rinsed, and dried. After oiling or waxing, finish is ready for service. Product is suitable for machined or threaded parts.

Parker Rust Proof Co, Detroit 11, Mich.



Variable Speed Motor With Flexible Shaft Control

Lightweight Varidrive motor, Type 5 VA, is equipped with a remote control feature which includes a control handwheel with indicator dial and a 5-ft flexible cable, enabling operator to control speed at a distance from motor.

Because the dial indicator is part of the control, operator need not inspect the motor to ascertain speed; connecting cable longer than 5 ft can be used, if necessary.

Unit is available in ¼, 1/3, ½, and ¾ hp, and in a speed ratio up to 10 to 1 over a range of 4 to 10,000 rpm.

US Electrical Motors, Inc, Box 2058, Los Angeles 54, Calif.

Air Hardening Flat Stock For Punches and Dies

Precision ground die and flat stock, made to a special analysis for hardening in air, is available for punches and dies used in long production runs or for stamping silicon, stainless steel, Monel, and other abrasive materials. An average of 50% more pieces per sharpening can be expected than with oil hardening steel.

Because of its non-deforming characteristics it is said to maintain accuracy of dimension throughout the heat treatment process. 5% chromium content gives it added wear resistance.

No. 497 stock is fully spheroidized annealed for easy machining. It is cut lengthwise from the sheet and ground to within 0.001 in. in thickness with a finish of 25-35 microinches for accurate layout work.

L. S. Starrett Co, Athol, Mass.

Wrigley model 350 forklift truck has been designed to operate in confined areas, gangways, or upper floors. ½-ton unit turns in a tight radius and may be handled with a minimum of training. Fork height closed is 5 ft 8 in.; open, 9 ft 6 in. Turning radius, less forks, 55 in.; with forks, 80 in.

Hambro Machinery Div, 17 E 54 St, New York 22, NY

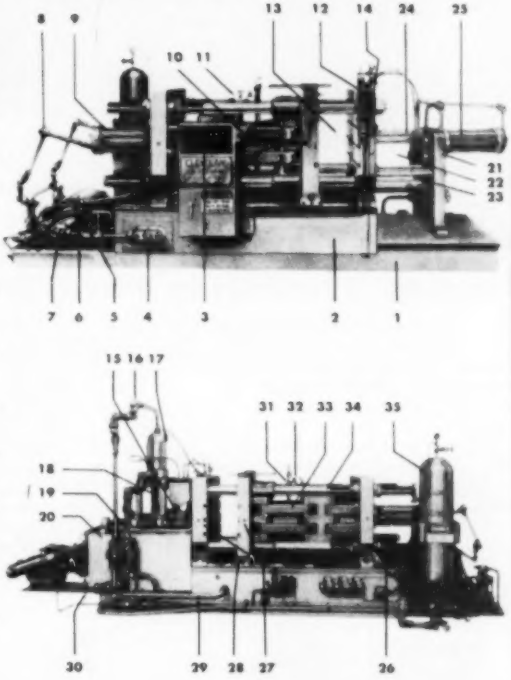
Why you can count on CLEVELANDS

to give you precision quality die castings at a highly profitable rate of production

35 POINTS OF DESIGN AND CONSTRUCTION SUPERIORITY have made Cleveland Die Casting Machines the leader in this field. Many of these features are exclusive with Clevelands . . . others were pioneered by Cleveland and are now in general use throughout the industry. *All* add up to give Clevelands the qualities so essential for successful die casting:

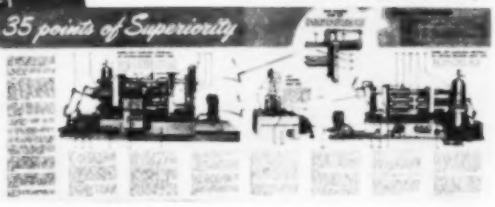
- Rugged, rigid construction throughout for dependable, economical performance
- Powerful die locking pressure
- Fast, shockless die closing and opening for high production operation
- High metal injection speed to produce sound, dense, "hardware finish" castings
- Safe and simple control—manual or automatic
- Ample elbow room for die mounting and machine maintenance
- Universal construction — easily convertible — for either hot or cold chamber operation

These are the reasons why Clevelands are selected by many of the nation's most experienced die casters . . . why *two* of the country's foremost die casting producers have installed 32 Clevelands each . . . and a *third* has installed 33! And why Clevelands can be found in 'round-the-clock production in 12 foreign nations as well. Let a Cleveland Engineer show you how Cleveland Machines can improve your production with money saved!



MAKE A POINT-BY-POINT COMPARISON OF CONSTRUCTION FEATURES . . . THEN YOU'LL CHOOSE *Clevelands!*

Bulletin 400 gives you complete details. Write for your free copy.



Photographs above, with 35 points of Cleveland superiority indicated, show front view of the widely-used Cleveland Model 400 with aluminum shot end, and rear view of the Model 400 with zinc shot end. Cleveland Model 400 has 36" x 38" die plates; 400 tons locking pressure. Other Cleveland machines include the Model 200, 30" x 31" die plates; Model 100, 22½" x 24½" die plates; Model 50, 18" x 22" die plates.

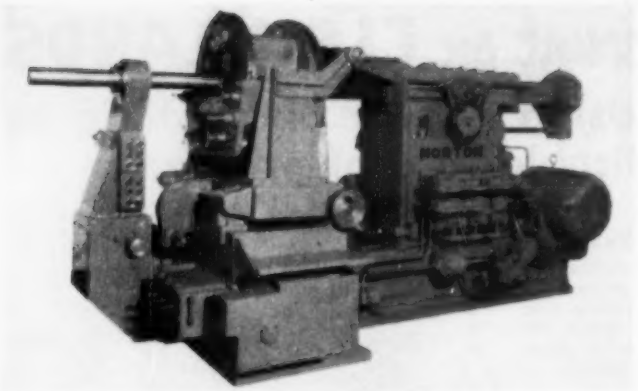
QUICK DELIVERIES NOW POSSIBLE ON MOST MODELS

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines



Hydraulic Draw-Cut Shaper Machines Tapered Openings in Breech Rings

This Morton draw-cut shaper has been especially designed for machining the rectangular tapered openings in forged or cast steel breech rings from 76 to 155 mm sizes.

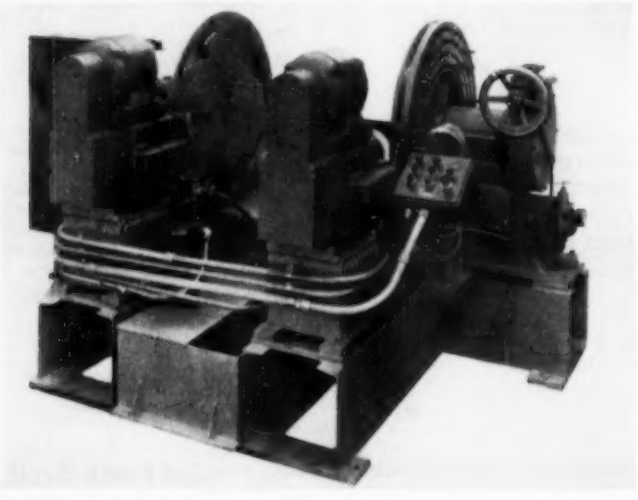
The ram is reciprocated hydraulically and has adequate capacity for removing heavy cuts at maximum feeds. An arbor within the ram provides rotary incremental feeds to the slotter bar which are made in sizes from 3 in. to 4½ in. dia, depending upon the rough opening size.

A special cradle fixture is provided which has both horizontal and vertical incremental feeds and power traverse. Breech ring is centered in a spool-type chucking ring which can be rotated through 180°. Fixture is also provided with an eccentric-operated mechanism which tilts it to the correct angle for establishing proper taper for non-parallel surfaces.

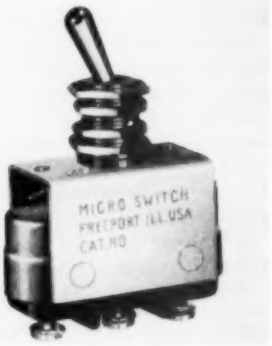
Through the combination of rotative feeds to the slotter bar and with vertical and horizontal feeds of the fixture, plus ability to index it through 180°, the breech ring can be completely rough machined in the inside of the rectangular opening without removal from the fixture.

Additional chucking rings may be provided so that the work can be loaded and centered in the extra ring, thereby keeping the machine in constant production.

Morton Mfg Co, Broadway & Hoyt, Muskegon, Mich



MILLING MACHINE designed to mill the inside flange faces of jet housings. Automatic air cylinders are used for clamping and housing against holding faces, and each milling head automatically oscillates in and out six times within the machining process to clear outside ribs. — *Pioneer Tool & Engineering Co, 3914 W Shakespeare Ave, Chicago 47, Ill.*



Sealed Precision Switch

Hermetically sealed precision toggle switch designed for aircraft can be used for other applications. Said to deliver full electrical rating without regard to changes in pressure or temperature or the presence of corrosive atmosphere, dust, dirt, oil or water.

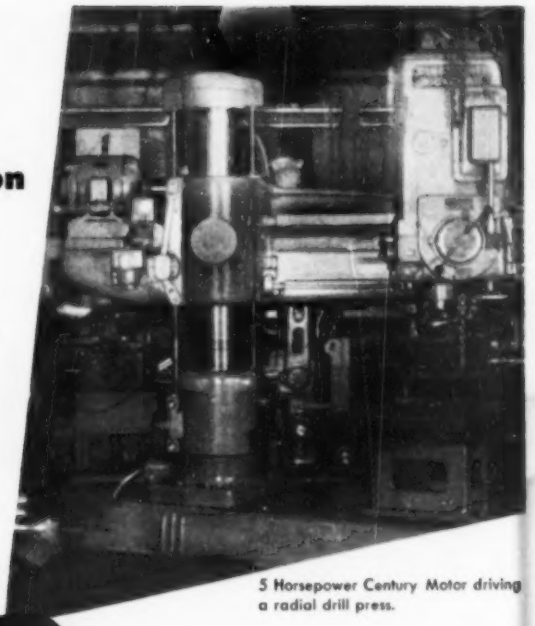
Tentative rating: 5 amp motor load 30 v dc, 10 amp inductive load 30 v dc, 25 amp resistive load 30 v dc, 1 amp for any type of load 125 v ac.

Micro Switch, Div Minneapolis-Honeywell Regulator Co, Freeport, Ill

Improved model of a magnetic grip shield for use as a safety guard is composed of a sheet of transparent, shatter-resistant Plexiglas, ⅛-in. thick, and a permanent magnet to which the plastic is swivel-mounted. Magnet holds guard securely in any position on a machine base. Grip-Shield's Alnico slug is surrounded with a Plexiglas ring; outer surface of acrylic plastic prevents chips from collecting on the magnet. Guard is available in sizes from 6x8 to 12x16 in.

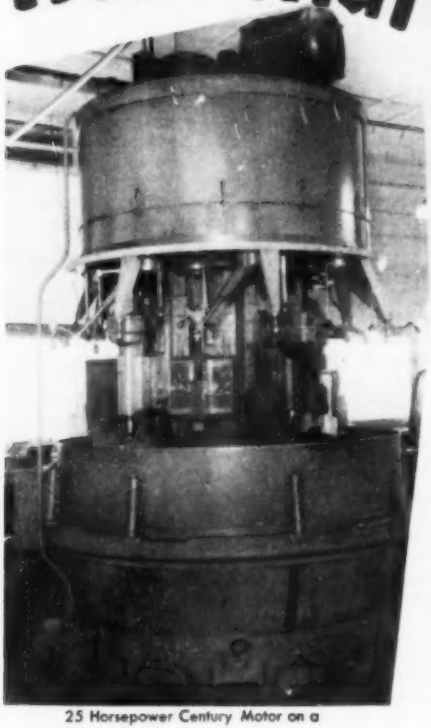
Dilley Mfg Co, 1626 Ansel Rd, Cleveland, Ohio.

On Your Production Machines . . .



5 Horsepower Century Motor driving a radial drill press.

Hold That Precision Line



25 Horsepower Century Motor on a Bullard Automatic.

With

Century Motors . . .

Widely Known for Their Unusual Freedom From Vibration

Century motors supplement the precision of fine equipment . . . resulting in closer tolerance of the product produced by the equipment.

The unusual freedom from vibration in Century motors is contributed by: Accurate concentric machining to provide a uniform magnetic airgap between the rotor and stator . . . Balanced electrical design . . . careful dynamic rotor balancing . . . accurately machined mounting surfaces.

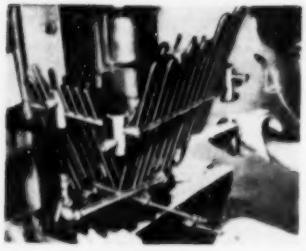
Century offers a most complete line of types and sizes from ⅛ to 400 horsepower.

Specify Century motors on your original equipment. Call a Century branch office or a Century Distributor for your motor requirements.

Century C MOTORS

CENTURY ELECTRIC COMPANY
1806 Pine Street
St. Louis 3, Missouri

CE-750



Punch Press Safety Guard

Front and side barriers of this basket enclosure guard for all types of punch presses can be tilted in or out, as required. Vertical rods can be adjusted up or down to clear the die straps, air nozzles, etc.

Entire front barrier can be tilted up or taken off quickly to remove double or damaged blanks from the die. Corner locking knuckles are designed to clamp firmly the round supporting bars without marring.

Available in several sizes, custom built to specifications.

Scarjeant Metal Products, Inc, Meadon, NY.

Pocket Measuring Microscope Makes 0.0005-in. Estimates

A 50X pocket measuring microscope, called Optometer, has an engraved scale mounted in the body tube which reads directly to 0.002 in. Estimations can easily be made to 0.0005 in.

Precision achromatic lenses, corrected for color and spherical aberration, produce a sharp image up to the edge of the field of vision.

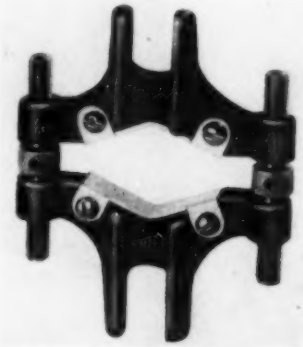
The tool, about the size of a fountain pen, is placed on the surface of the part to be inspected, and a light is directed obliquely toward the tapered opening. Focusing knob is moved back and forth until the object is in focus; linear dimension is read directly on the graduated scale.

Optometer retails for $19.50 with leather carrying case.

National Instrument Co, 5005 Queensbury Ave, Baltimore 15, Md.

Custom-fabricated thread protectors for safeguarding external and internal threads and surfaces on machined parts safeguard against damage and act as an efficient seal against dust, dirt, grit, or rust. Made of Kraft, fish paper, cellulose acetate or combination, they are acid-free and non-corrosive. They are equally useful in keeping out oil or grease or used as lubrication retainers. Available in practically any size or shape, protectors can be formed, crimped or perforated to fit irregularly shaped parts. They are spirally wound by a process which permits maintenance of tolerances within 0.003 in.

Precision Paper Tube Co, 2035 W Charleston St, Chicago 47, Ill.



Universal Grinder Dog Has Time-Saving, Adjustable Feature

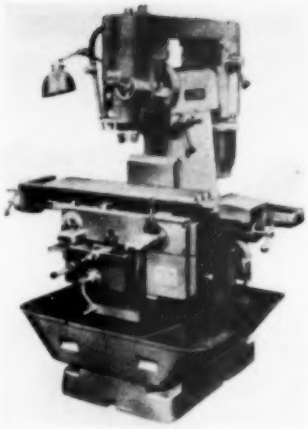
Red-E universal grinding machine dog has a brass face design claimed to eliminate marring and damaging of soft, finished, or threaded work. When the dog is opened to greatest capacity, drawing pins in the face plate will not come in contact with the bottom of the slot.

Two styles are available: No. 101, with a capacity of ¼ in. to 1½ in., and No. 102 with a 1⅜-in. to 2½-in. capacity. Adjustable feature enables operator to use one dog instead of the usual three or four.

Ready Tool Co, 55½ Iranistan Ave, Bridgeport 5, Conn.

Safety goggles, called 220 Series Goggle, provide unobstructed side vision by placing temples above the line of sight. Bridge is strengthened by joining eye wires at four points to distribute evenly any stress over a wide area. Available with curved or flat standard 47 mm or 44 mm clear or absorptive safety lenses. Side shields of wire mesh, leather, or clear or green acetate are interchangeable. Variety of bridge widths and lens sizes make product adaptable for many operations.

Pennsylvania Optical Co, Reading, Pa.



Loewe-made German Machine Tools Has United States Distributor

Complete line of machine tools, manufactured by Ludwig Loewe & Co, Berlin, Germany, now being imported to this country, include the following machines:

Lead screw and production lathes in various sizes

Vertical, horizontal, and universal milling machines in three sizes, with single-lever controls

Universal tool and cutter grinder for a variety of applications

Special reamer honing machine to allow a balanced load on all cutting edges of reamers

High-precision optical profile grinder featuring a built-in comparator

Stock of machines and parts are being carried by US distributor:

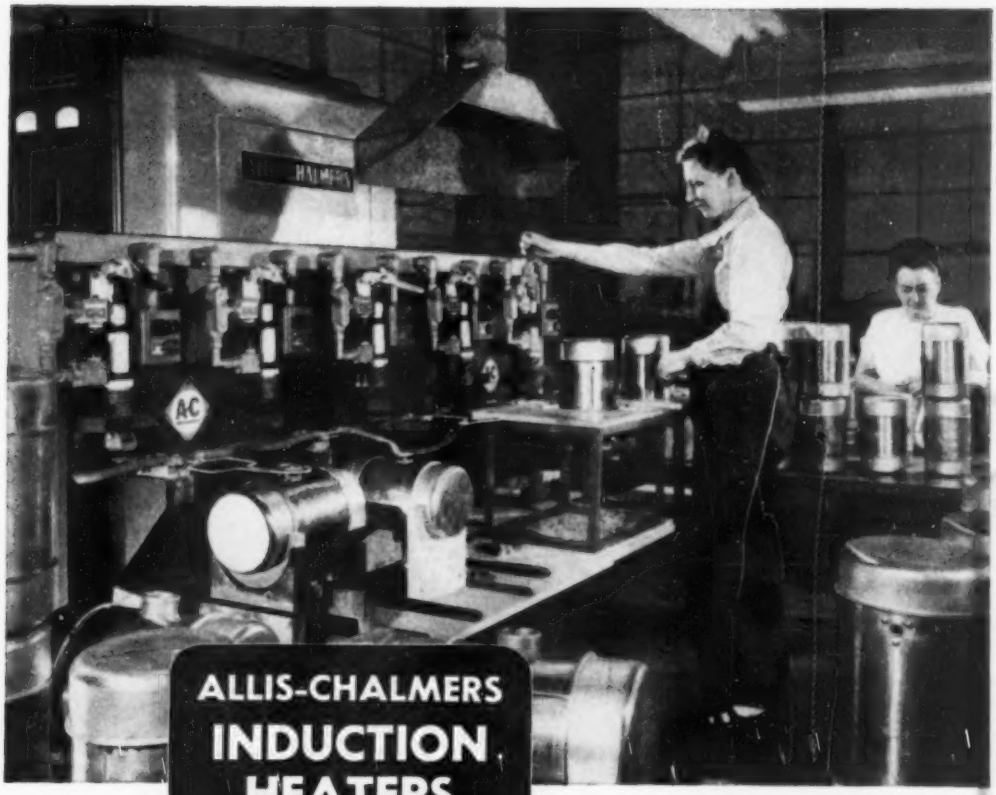
Eric K Bachmann, 27-11 41st Ave, Long Island City 1, NY.

Rocket highspeed hand blade has been added to the Barnes line. Only the teeth of the blade are hardened; back is semi-hardened to retain flexibility. The all-purpose tool can be used for cutting a wide variety of metals and shapes.

W O Barnes Co, Inc, 1267 Terminal Ave, Detroit 14, Mich.

Soldering iron, designed for pinpoint accuracy on precision work weighs only 3 oz (less cord) with a ⅛-in. dia tip, and is rated at 25 watts. Unit has nickel-chromium, mica-wound mounted elements; it requires no transformer to operate. Available for either 110 or 220 v, dc or ac. List price $5.

Hexacon Electric Co, 135 W Clay Ave, Roselle Park, NJ



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BOOSTED PRODUCTION 233%

Problem: How to soft solder five joints on gas tanks.

Old Way: Air-gas torch soldering.

New Way: 20-kw Allis-Chalmers induction heater with five station fixture.

Result: Production increased from 15 to 50 tanks per man-hour. New handling methods will increase production even more.

SOLDERING IS HANDLED progressively at five stations using five different fixtures. Each fixture is interlocked so that power is applied only to station being used.

Time cycles vary and are automatically controlled by an individual timer at each station. Handling has already been reduced 70%.

Whether your job is soldering, brazing, hardening or annealing, it will pay you to investigate Allis-Chalmers Induction Heaters and find out about the spectacular savings you can make. In fact, there may be complete data on a job similar to yours already processed in A-C's electronic laboratory. Simply call your nearby Allis-Chalmers district office and outline your heating problems, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS
Milwaukee 1, Wisconsin

- ☐ Please send me Induction Heater booklet 6430A.
- ☐ Please send print of 16 mm color sound film "Induction Heating, Industry's Modern Tool."
- ☐ Please have Engineer call.

Name

Title

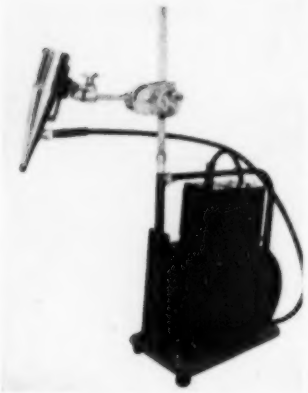
Company

Street

City State

A-3646

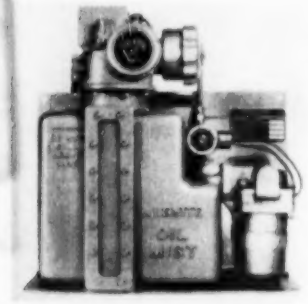
ALLIS-CHALMERS



Welding Gantry Features Tri-Directional Adjustment

This specially designed gantry for semi-automatic welding units features a rapid, tri-directional adjustment for the welding gun. Added feature of this fixture is the easy access the operator has to all welding machine controls because the entire unit fits compactly on a caster stand beside him. All circumferential welds from practical minimum to 54 in. in diameter can be made with the standard rack.

Hilco, Inc, 2741 East Latimer, Tulsa, Okla



Signal Switch on Lubricators Warns of Low Oil Level

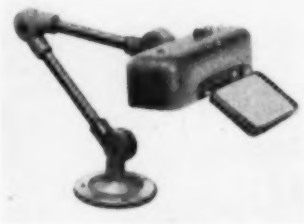
Oil-Mist lubricators have 1-gal. oil reservoirs and built-in automatic warning switches which signal the operator by horn and red light, or shut off the machine as the oil level becomes too low.

Previous models, through employment of a solenoid switch, gave lubrication when the machine on which they were used was in operation, but had provision only for visual measurement of oil remaining in the reservoir. The gal.-size reservoir cuts frequence of filling and the signalling device makes it impossible for the unit to run dry accidentally.

Two gal.-reservoir models are available. One, Model 4958, is wired with a normally open switch which makes contact when the level of the oil goes below 23 oz. Switch sets off an immediate warning by red light and/or horn. Model 4859 has a closed switch which breaks contact when the oil level goes below 23 oz and shuts off the machine.

The new 12-oz reservoir models having low-level signalling devices are also available. Model 4960 shuts off the machine as the oil level drops, while Model 4961 either sets off a warning horn or flashes a red light when oil falls to the 2 oz mark in the reservoir.

Stewart-Warner Corp, Alemite Div, 1826 Diversey Pkwy, Chicago 14, Ill.

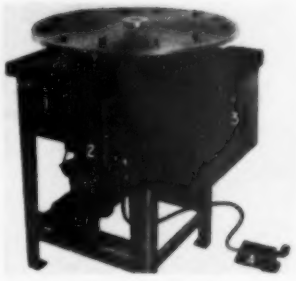


Illuminated Magnifier With Fluorescent Lighting

This portable high-intensity fluorescent fixture designed primarily for industrial inspection, produces intense but cool glare-free illumination with high magnification. Model 66SV is equipped with either a 2- or 4-power lens of 2 in. x 4 in. dimensions. Lens holder is hinged, offering the inspector complete versatility of using the light with or without the lens. Lens also acts as chip shield when in use, preventing foreign material from entering or endangering the inspector's eyes. Up to 500 ft-c of intense illumination is provided, yet the lamp shade never gets hot.

Model 66SV is factory-equipped with either a heavy portable cast base or for a more permanent installation; unit can be supplied with longer arms for machine or bench mounting. The fluorescent tubes are rated at 7500 hrs average life which normally represents over 3 years between lamp replacements.

Stocker & Yale, Inc, Marblehead, Mass



Multi-Purpose Motorized Turntable for Production Lines

This motorized turntable can be supplied with from 6 to 48 positions. It is designed for various production lines where the requirements call for turning the work spindle, rotating the spindle, and starting and stopping at various positions; many operations can be placed on the particular spindle in accordance with requirements.

Some applications for the metal industry include: use for soft and silver soldering, brazing, assembling, spraying, marking, welding, induction heating, etc.

Index speed can be adjusted with the combination of the timer and adjustable speed pulley from a few seconds to several minute intervals. Additional foot switch can control the index time for any desired length of operating period. The work spindles are either rotating or stationary.

Turret with operating positions is placed above the table; underneath are located all driving parts, Geneva index mechanism, speed reducer, motor with adjustable speed pulley, and solenoid-operated clutch. In front and side of the machine are located electrical equipment, motor starter, relay, timer, and foot switch.

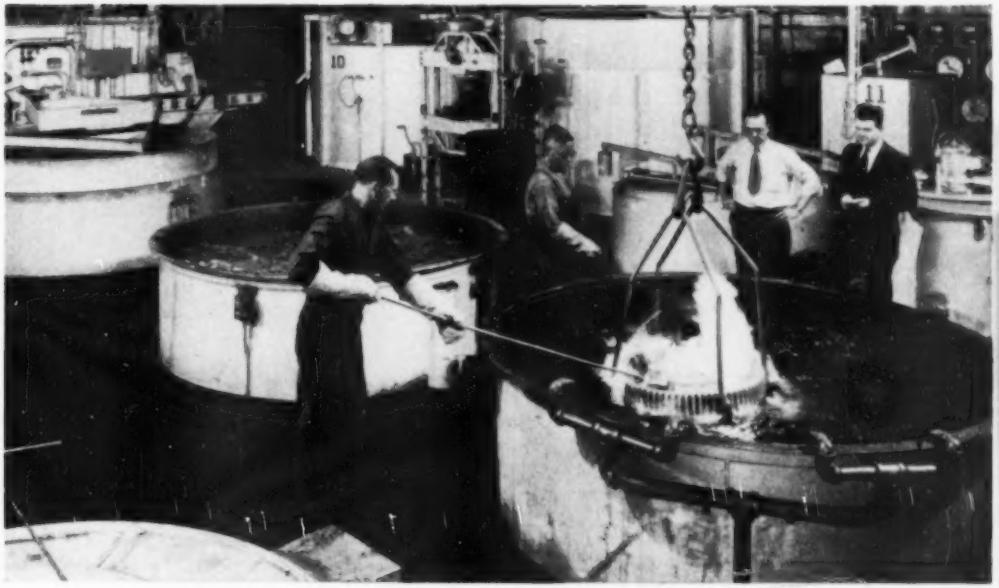
Floor space is 40 in. wide by 40 in. long by 42 in. high; approximate weight, 800 lb; ½ hp.

Eisler Engineering Co, Inc, 750 So 13th St, Newark 3, NJ

Nu-Twist holders and electrodes for spot welding forces over 6000 lbs are designed with flat mating surfaces between holder and electrode. This eliminates threaded and tapered connections. Manually operated electrode locking nut requires no tools, permitting easy removal and replacement. Holders available in 8- and 12-in. lengths, and in 1½-in., 1¾-in., 2-in., and 2½-in. barrel dias. Electrodes in Elkaloy A, Mallory 3, and Mallory 100 metal.

P R Mallory & Co, Inc, 3029 E Washington St, Indianapolis 6, Ind.

Want deeper hardness on low alloy steels without distortion or cracking?



switch to GULF SUPER-QUENCH

GULF SUPER-QUENCH is exceptionally fast — produces deep and uniform hardness on all types of alloy steels. Deeper and more uniform than is possible with conventional quenching oils. It is particularly effective on the substitute steels which have low hardenability characteristics.

Add the fact that GULF SUPER-QUENCH has the same minimum tendency to distort and crack as conventional quenching oils and you can see why GULF SUPER-QUENCH is often the difference between successful quenching and a high percentage of rejects.

No matter what alloys or shapes you quench, you will gain from the greater quenching power of GULF SUPER-QUENCH. Ask a Gulf Sales Engineer for further details on this outstanding quenching oil. Write, wire, or phone your nearest Gulf office.

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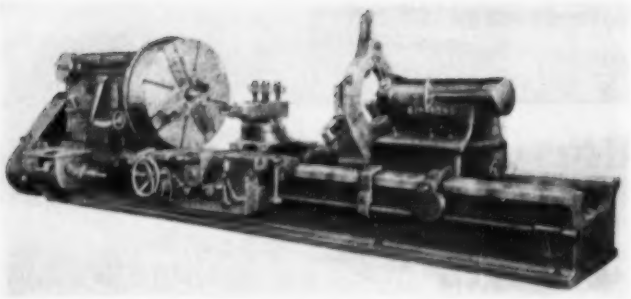
GULF OIL CORPORATION
GULF REFINING COMPANY
Pittsburgh 30, Pa.



Simmons 48-in. Engine Lathe Redesigned for Power, Rigidity

Swing over bed ways	51 in.
Swing over carriage bridge	36 in.
Between centers, 20-ft bed	10 ft
Speed, variable voltage drive	1 to 144 rpm
Hole through spindle, dia	4 in.

This redesign of the Simmons 48-in. engine lathe is intended primarily for ordnance plants, shipyards and other shops having heavy turning, facing, and threading operations.

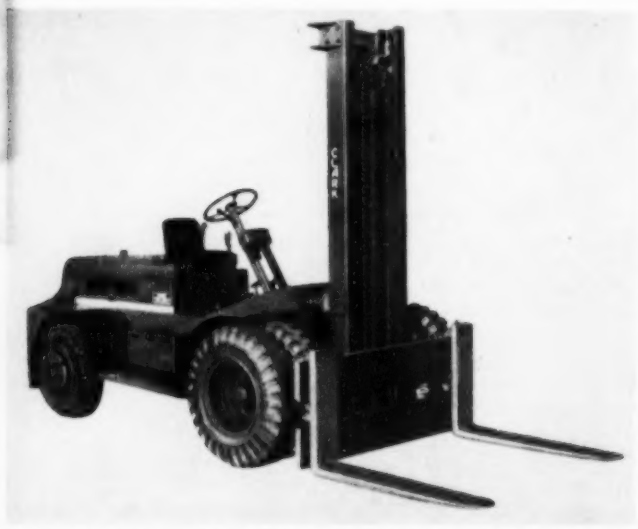
Bed lengths run from 20 ft to any required length in 5-ft increments. Bed has an angular guide front way with a continuous flange for rigidity. Width of bed is 46½ in. Variable voltage drive operates through a geared head with three gear changes.

New feed gear box provides threads from ½ to 56 per in. Lead screw is now 3½-in. dia. Tailstock spindle has been increased to 7-in. dia. Also built in 54- and 60-in. swing.

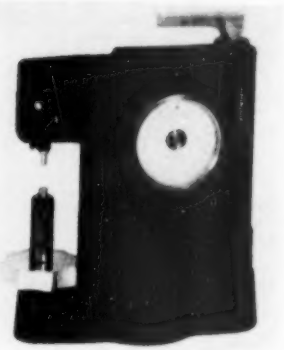
Simmons Machine Tool Corp, Albany 1, N Y.

Silver brazing flux G-B No. 99 is claimed to have exceptional ability to climb and spread over entire joint area, providing max action during brazing. It will quickly dissolve metallic oxides, permitting a uniform flow of silver solder. Fully active through a low temp range of 800-1350 F. Recommended for use with solder having melting range of 1145-1300 F. Dehydrated dry flux is available in 2-oz, ½-lb, 12-oz, 1- and 5-lb jars.

Goldsmith Bros Smelting & Refining Co. 1301 W 59th St, Chicago 36, Ill.



FORK TRUCK FOR OUTDOOR WORK, Yardlift 100, has a 10,000-lb capacity at 24-in. load center. Powered by Continental gas engine with 55 brake horsepower at 2000 rpm. Turning radius is 133 in. and lift is 144 in.— *Clark Equipment Co, Battle Creek, Mich*



Hardness Tester Has A and D Scales Added for Thin Sheets

Features of this 3-in. capacity hardness tester include addition of the A and D scales to the current C-B and E scales. Operator is enabled to test very thin sheet steel; with the C scale, major load is too great for thin stock.

Visional means for setting the instrument to the different load factors for different scales used prevents mistakes in setting the machine.

J P Newman Co, 821 S Raymond Ave, Alhambra, Calif.

Dial Indicator Gage Checks Large Diameters

A dial indicator gage for checking large dias has been added to the regular line of Boice dial bore gages.

New unit was designed for use in the jet industry, but is applicable wherever the problem of checking large ID or OD occurs.

Gage is of a light tubular construction, equipped with any style of indicator necessary for the specific job. Gaging contact is retractable so that gage can be inserted into the bore. Depth of gaging is controlled by rests which contact the face of the workpiece.

Boice Mfg Co, Box 1098, Poughkeepsie, NY.

good judgment calls for

PARKER-KALON®

when good design calls for

SOCKET SCREWS

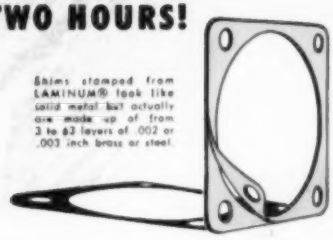
P-K SOCKET SCREW BULLETIN

16 pages, describes all types, lists sizes, and illustrates quality control back of P-K guarantee. Free on request from your local P-K Distributor. Ask for samples. See why P-K Socket Screws take top honors in any test. Parker-Kalon Corporation, 200 Varick St., New York 14.

2 Seconds

CAN SAVE YOU TWO HOURS!

Shims stamped from LAMINUM® look like solid metal but actually are made up of from 3 to 63 layers of .002 or .003 inch brass or steel.



Adjusting bevel gear mesh with a laminated shim is a matter of two seconds to remove a lamination!

The shim in this case is made of LAMINUM®, our exclusive material. It is a "solid" unit built up of 16 layers of .002 brass. It peels quickly and easily. Each shim removed adjusts the bevel gear position by two thousandths.

You save time by easier machining tolerances on the housing; ***you save time*** by eliminating pesky assembly machining; ***you save*** by not tying up a machine intermittently. IT'S EASIER!

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ROUND TABLE Discussion

BORROW — OR STEAL?

Should workers be allowed to borrow tools for occasional private use? Will such a policy lead to excess? Will the tool be borrowed anyway, if the request is refused? Readers say . . .

ONE WAY FOR an employer to build up good feeling between himself and his workers is for him to show them that he has their interests at heart. If he refuses to assist them by not letting them have the use of a tool now and then, it's evident that he cares very little for their welfare.

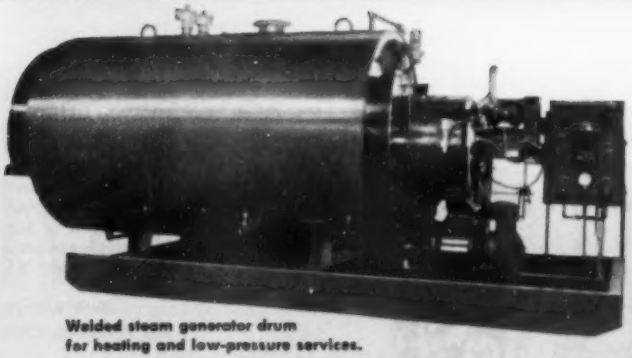
The average man cannot afford to purchase everything he needs and the employer can very well afford to loosen up a bit to help him over a hump by sharing with him small items which he will not miss. What damage is Rogers going to do to a couple of pipe wrenches; if he does he will make it right.

One company where I was employed thought so much of their employees' interest that they would furnish them with umbrellas whenever it rained. This, of course, was prompted by a desire to keep the men from getting colds from exposure when a sudden rain happened along during the day. The use of a pipe wrench or the like would also preserve the man's mental health by giving him the feeling that his interest was paramount. Oh, there may be some who would abuse the privilege of taking a tool or two out of the plant to help them in an emergency but they are very few in comparison to those who don't.

I'd have a system, though, where a record could be kept of anything that went out of the plant. This could be done by the tool-crib attendant. I wouldn't depend on the check alone if something was taken out; I'd have a form to be filled out by the borrower and signed by him, signifying his responsibility for its being returned in good order, also to pay for its replacement in the event that it becomes lost.

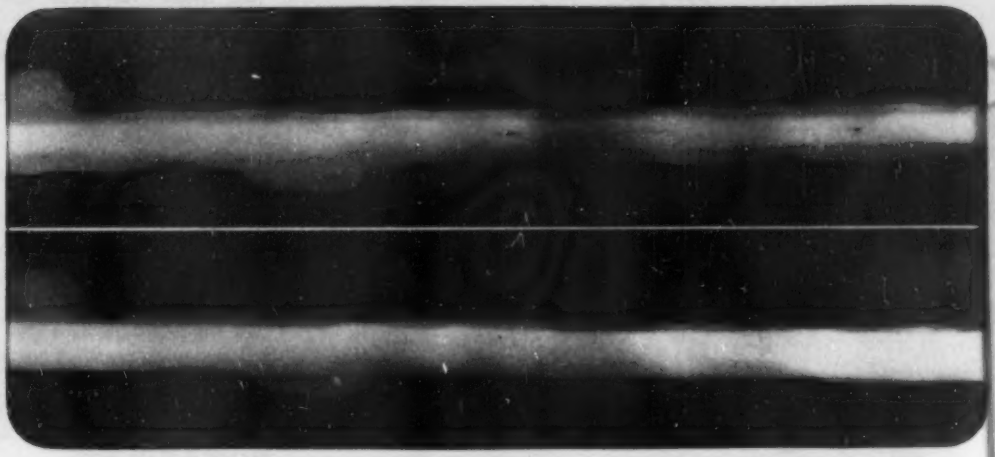
This is an annoying situation for the foreman and I wouldn't advise the practice of a deal between the foreman and the borrower, as this places the boss in the position of doublecrossing the firm he is pledged to guard.

In order to prevent unnecessary



Welded steam generator drum
for heating and low-pressure services.

Dependability up—cost and weight down—



thanks to RADIOGRAPHY

BECAUSE radiography proves it sound, welding can be used for making better pressure vessels. And with results such as these: In these steam boilers approximately 15% in weight was saved—costs dropped 10% to 20% dependent on design pressure.

Easy to see, isn't it, how radiography opens new fields for welding—why it increases business.

Radiography is quick to detect any serious lack of fusion or gas porosities in a weld. It can help you make sure only top-quality work leaves your shop.

If you would like to know more about how it can help you, get in touch with your x-ray dealer and talk it over.

EASTMAN KODAK COMPANY
X-ray Division • Rochester 4, N. Y.

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Grinding Wheels

Simonds Abrasive Company Snagging wheels for heavy production grinding! That's the suggestion. It's a worthwhile one for *your* grinders, too . . . swing frame, floor stand or portable. These wheels are plenty rugged, with smooth hard sides that hold up on corners without impairing cutting action.

Perhaps *your* jobs don't involve snagging. No matter! If they call for grinding wheels, call on your Simonds distributor. He has the wheels you need for grinding, shaping, finishing and sharpening . . . grinding wheels, mounted wheels and points, segments, abrasive grain . . . products proving their worth in every phase of industrial grinding.

Write for name of your Simonds distributor, and free data book.

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y.; Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

borrowing, how would it be to have a charge for the lending of tools—if nothing more than that the charge will cover the cost of records and possible depreciation. Any consideration shown the men to assist them in surmounting their financial difficulties will be returned in loyalty and effort. Cast your bread upon the waters is a good slogan for employers to remember.

Jack Everett
San Francisco, Calif

•

"SAY, HARRY," the planer operator confides to his boss, "I've got a little electrical work to do at home and I'm going to need an electric drill." Harry and his boss were friends of long standing and the chief felt that he couldn't very well refuse.

Harry took the drill home and used it on his job. When he had finished he felt in need of a bracer and went out to have a drink. The next day the man didn't show up for work and the boss thought that he had taken the day off to finish up his job. Finally after a week of Harry's absence he made a call.

"Harry's been on a binge all week, Tom," the wife informed him; "he met up with a friend of his whom he worked with out in Chicago and I suppose they are making up time."

"Would you mind letting me have the drill he brought home; we're needing it at the shop."

The wife looked all around and couldn't locate it. Just as she was telling Tom that she couldn't find the tool, one of the youngsters informed his mother that his Pop had taken it with him that morning. It turned

"And YOU talk about 'The mess in Washington'!"

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fastest machining of all structural metals!

Magnesium parts can be machined at higher speeds and feeds than any other structural metal. This has proved an influencing factor in its use, even where weight saving is not of primary importance and the cost of the magnesium part is higher than the competitive material *before either is machined*. With power consumption as a basis of machinability comparison, magnesium requires only one-half to two-thirds the power required for brass or aluminum, one-third that for cast iron, and one-sixth that for steel. In one case a switch to magnesium from cast iron for pulleys resulted in a saving of 45 minutes per part. It has also been observed that cutting tools last from 3 to 10 times longer when machining magnesium than when machining aluminum under similar conditions. In addition, excellent surface finishes have been obtained because there is no metal drag or tear.

Dow has over 30 years experience in magnesium—a call to your nearest Dow sales office will put this knowledge at your disposal.

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19651 JOHN R STREET
DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED

out that Harry had pawned the drill to provide money for his drinks. Needless to say, Harry was canned and the boss, in order to save his own neck, had to dig down to get the drill out of hock. Unfortunately a long friendship had been broken up, but Tom had learned a good lesson.

This is one of the many complications and annoyances usually accompanying the lending of company tools. Harry should not have taken advantage of his friends good nature and Tom should have refused to lend him something that didn't belong to him.

Company tools should not be loaned out in such a slipshod manner. If they are going to be available for use, there should be some rigid system whereby the plant will be protected from loss or damage. There are many employers who consider the welfare of these employees to such an extent that they put themselves out to help them conserve their finances. This is all very well if not taken advantage of by the worker. It seems like a small thing to refuse a request such as Harry made but one can easily see how complications may arise.

Assuming that a company does have a system whereby its employees can borrow a tool, it must be evident that there is considerable expense involved to keep records of what goes out and is returned. The point is that once the practice is started of letting a man have the use of something one cannot control it without the use of proper forms and protective checks. If an electric drill is loaned out, why couldn't a man

"Well Yes, guess the department is out of balance—4 operators and 9 inspectors!"

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POSITIVE DISPLACEMENT AND IMPELLER TYPES

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Finest for SPEED: Taps more quality threads per hour, more holes than any other tapping attachment.
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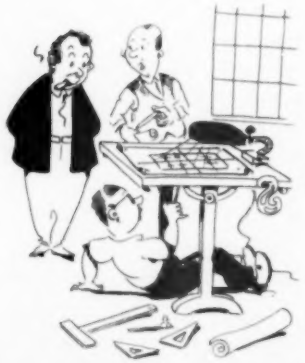
apply for a small drillpress or a bench lathe?

I feel that the great mistake is in the company not establishing a rigid policy so that the employees may know how far their privileges may extend. Undoubtedly an easily-seen notice was posted on the bulletin board following Harry's abuse and the other men had a session of gripes for awhile. No doubt Tom decided that a notice would relieve him of embarrassing situations in the future. We all know that many employees cannot afford such luxuries as electric drills. There are places available where they can rent such tools at a reasonable cost.

Some may say that the size of the plant determines whether a tool can be loaned out. A feeling of camaraderie between the employer and his men will naturally make the lending of tools a different thing in the small shop, whereas, were the employee one of thousands in a plant where the manager and employee are practically strangers, it's a different story.

It is just as easy for the "old man" in a small shop to establish a non-lending policy as it is for the head of a large plant. If it is shown right at the start of employment that lending of tools is absolutely taboo, no trouble will be experienced. There is no need for the applicant to become sore if he is refused a loan. If he worked in a large place he would just shrug his shoulders and say, "That's that," and go about his work.

There is the possibility that one will be brazen enough to take matters in his own hands and cart whatever he wants through the gate and return it unharmed—possibly he may just keep it and gloat over the fact that he is a pretty slick guy. This is a rare case, however; it is surprising how honest people are. So, in my



"Our expert who drafts all the underside projections."

own opinion, if one needs something let him buy it; if he can't afford it let him do without if he can't rent it.

J. Homewood
Ontario, Calif.

WEARING OFF THE GREEN

Will a little extra time spent on breaking in a new man pay off in the long run? Is it better to gain a man's confidence and ease the strangeness of a new job, or should he be left to himself to catch on gradually?

INTRODUCING A new man to the shop and its peculiarities by the foreman should not start in the actual plant, but in the employment office during the applicant's interview. At present, the prospective employer is faced with two problems regarding new men: first, find your new man; second, find out how to keep him.

There is not much point in indulging in expensive advertising for new hands if they are allowed to be discouraged and to drift away to other firms who give after-sales service in the form of personal attention from the foreman or other executive.

The first morning at a new job is something of an emotional crisis for the worker. Everything is new and strange to him. If he is keen on making a good show at the job, so that he will be regarded as an asset to the firm, he may, in his anxiety to please, bungle and fumble and succeed in making everyone think he is an idiot, instead of a stranger striving to make a good impression.

At the outset, the foreman should drop whatever he is doing and have a talk with the new recruit. It is probable that the new-comer is a total stranger, unknown to anyone in the plant, and a friendly talk with the foreman will make the man feel that he has one friend and will thereby be encouraged to relax.

Relaxation of nervous tension is essential in the new man on his first morning, and a friendly hand from the foreman is the one way to do it. The foreman is the only one who can do it, because in an efficient plant, all other employees should be head down and tail up getting on with their jobs and not hanging around swapping yarns with a new workmate.

When I was an itinerant machinist, I spent many miserable first mornings in new jobs, and I generally knew in my first hour in the shop whether I was going to stay there for several months or just stay out the week. Invariably, the long-term

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Flexible Cord

DYNAPRENE is superior in performance because it is superior in quality. Jacketed with a special neoprene compound that provides exceptional resistance to abrasion; vulcanized by the continuous steam cure process that assures accurate centering, even cure with no flat spots and consequent uniformity of jacket thickness, the superiority of **DYNAPRENE** is understandable.

Add to these advantages greater flexibility, high tensile strength and the fact that the neoprene jacket is flame retardant and it adds up to additional superiority.

Superior too, is **DYNAPRENE'S** resistance to the harmful effects of oil, grease, sunlight and most acids.

DYNAPRENE exceeds Underwriters' requirements for SO, SJO and SV-neoprene jacketed cordage. Be sure to specify Whitney Blake **Dynaprene** for your flexible cord requirements.

WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE CO.

NEW HAVEN 14, CONNECTICUT

jobs would have a foreman who came along, ostensibly to give me a job to do, but who actually stayed for an hour or so giving me the low-down on the way they worked at that particular place. The majority of such shops ran very smoothly and it was obvious that the foreman took a personal interest in his staff and thereby got the best out of them.

In pre-war days, it was no uncommon thing for the new man in a shop to be expected to weave out the work during his first shift, as if he had been with the firm a year or more. Even in those days, the foreman who regarded a new man as a human being and not just a number could be encountered. The new man could always make a good showing on his first shift since the foreman had made him feel comfortable and relaxed.

It is generally agreed that a high labor turnover is a sign of bad management, and is wasteful. Therefore, anything that will keep down the turnover figure will show a profit. The foreman can do a lot to reduce turnover if he puts himself in the position of the new hand, figuratively speaking, and helps him get over those first few agonizing hours in the plant. It costs nothing, but pays dividends.

Clifford T Bower
London, England

•

IT IS WELL worth while when an employee starts work in a new place to acquaint him with his surroundings as quickly as it can be thoroughly done, so that he may acquire that comfortable feeling that dispels doubt.

Recommendations from reliable

"Now this I call oversimplification . . . nothing but an on-off switch."

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Full of suggestions FOR FASTER, CHEAPER PRODUCTION

New MEAD AIR POWER CATALOG illustrates, describes the complete line of famous MEAD-DESIGNED Air Operated Devices which have been speeding work, saving time and money for America's most "Cost Conscious" plants! Get your copy.

IT PICTURES THESE AIR-OPERATED DEVICES

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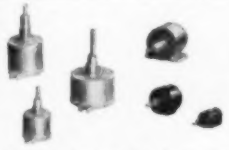
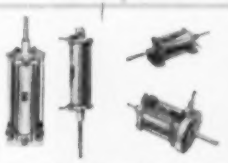
Midget Air-Clamps*


Single Acting Air-Clamps*


Double Acting Air-Clamps*

*AIR CYLINDERS

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Other Work Feeders

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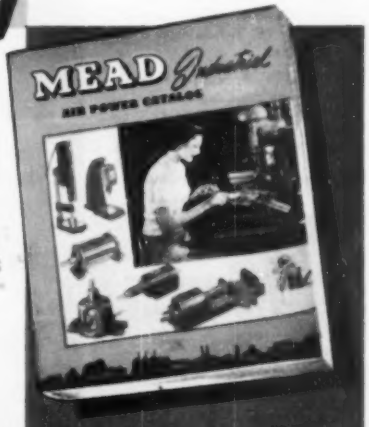

Tear out memo coupon— to remind you —or better yet mail coupon now!

*Originators of the famous Air-Clamp** and **MEAD AIR OPERATED DEVICES**

MEAD SPECIALTIES COMPANY

Memo Coupon

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MAGICIANS

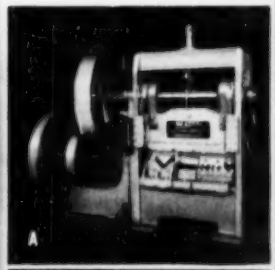
We don't pull rabbits out of hats. Our specialty is designing and building machines that work like "magic" in solving many heavy metal working production problems. The machines shown are typical examples. One of them may be just the answer for your personal production problem. If not, our broad experience in varied fields of the metal working industry enables us to design and build the ideal machine to meet your specific demands.

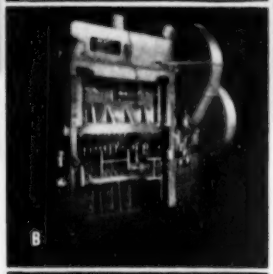
A. BEATTY Guillotine Bar Shear for "short order" shearing of bars, angles, rounds and squares.

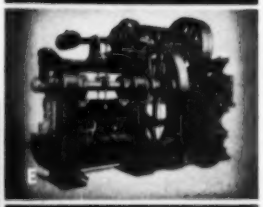
B. BEATTY Guillotine Beam Punch. Punches webs and flanges in "I" beams from 6 to 30 inches.

C. BEATTY Spacing Table handles web and flange punching without roll adjustment.

D. BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging and bending.







BEATTY
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E. BEATTY CoPunShear, one unit that does coping, punching and shearing without changing tools.

F. BEATTY Gap Type Press for forming, bending, flanging and pressing. Capacity 250 tons.

sources should be given due consideration, but a man's actual worth in the position to be filled is well worth the foreman's time in talking to the employee and showing and explaining thoroughly how and why a certain procedure has proved to be the best up to the present time.

No set time can be stated for finding out what a new employee can and will contribute to improving a job; that will depend largely on the foreman's ability to gain the man's confidence and fully judge his ability.

Such procedure should be used to develop and save new men without creating dissatisfaction among others.

John Mark May
Watervliet, NY

•

WHO RATES THE BOSS?

Is a foreman-rating card, to be filled out by the shop men, a healthy idea for general morale? Would such a policy result in overboard criticism, or might it not bring to light a few weaknesses which the foreman could easily correct?

IN A DEMOCRATIC society, it is reasonable to assume that if a foreman can express opinions and grade his workmen, then the workmen should be able to reciprocate.

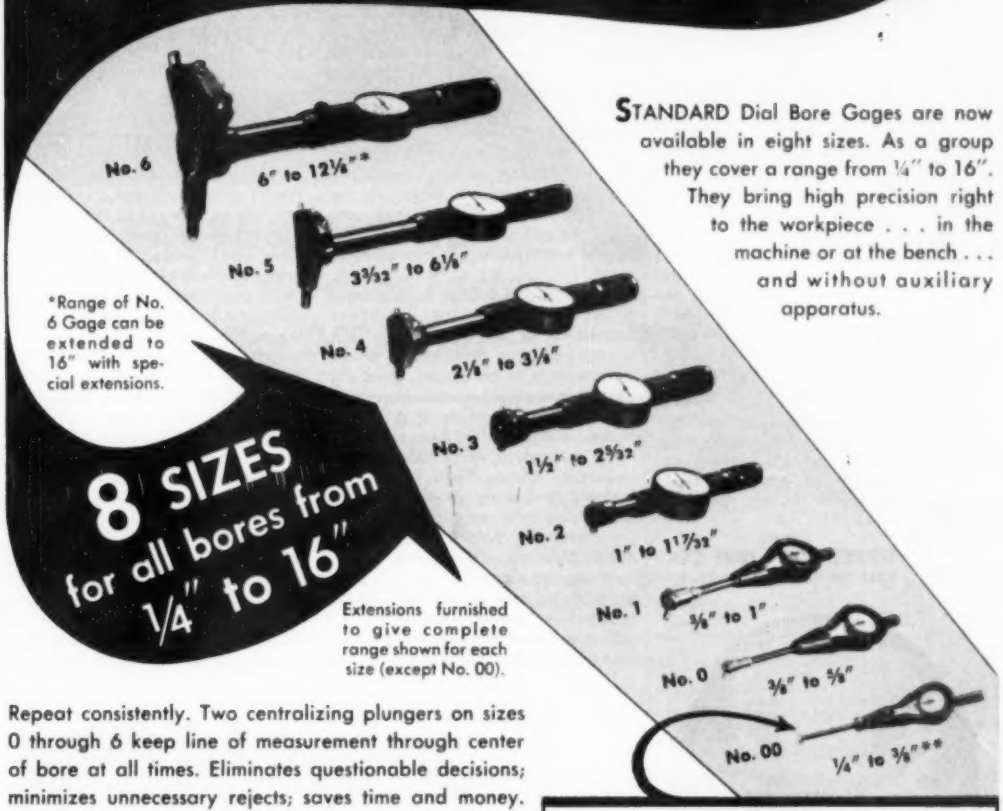
In these days of universal education, it is probable that the average workman is equal in intelligence to his immediate supervisor and, therefore, capable of assessing his capabilities. Because the general level of intelligence and education is now fairly uniform, and human nature is prone to de-bunk the abilities of those in executive positions, it is advisable that the setup used for

"You were a riot at the shop party last night . . . especially with that story that I didn't know a lathe from a band saw!"

Now!...a Wider Range!

STANDARD DIAL BORE GAGES

for Positive, Direct, Precision Measurement



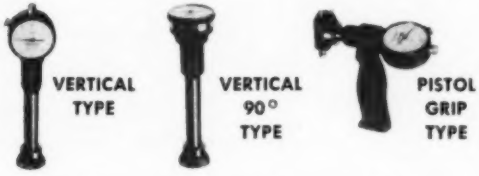
*Range of No. 6 Gage can be extended to 16" with special extensions.

8 SIZES for all bores from ¼" to 16"

Extensions furnished to give complete range shown for each size (except No. 00).

STANDARD Dial Bore Gages are now available in eight sizes. As a group they cover a range from ¼" to 16". They bring high precision right to the workpiece . . . in the machine or at the bench . . . and without auxiliary apparatus.

Repeat consistently. Two centralizing plungers on sizes 0 through 6 keep line of measurement through center of bore at all times. Eliminates questionable decisions; minimizes unnecessary rejects; saves time and money.



In addition to above, special gages available for out-of-ordinary applications.

NEW!

The No. 00 Gage with Centering-size Discs for checking bores ¼" to ⅜" with tolerances up to .005"

**Regularly supplied with a centering-size disc made for dimension specified by user. Discs of other sizes may be readily interchanged. If set of discs is desired, covering complete range of ¼" to ⅜", write for information.

Patent Applied For

WRITE FOR DETAILED INFORMATION

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

. . or Released in an Instant

Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts *never* work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study *your* fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

Write
GREER STOP NUT CO.
2620 Flournoy, Chicago 12, Ill.

GREER Stop Nuts

obtaining workmen's opinions be carefully thought out. There must be adequate safeguards in the method used to conduct an opinion poll of this nature, so that the maximum of useful information will be brought out while opinions based on emotion be suppressed.

It is assumed that the information desired to be obtained from the poll will be put to good use and acted upon. If a poll is to be instituted out of mere curiosity on the part of management, then it would be advisable for them to think again and scrap the idea. A properly conducted poll will take time, energy and money to carry to its conclusion, and is an expensive way of satisfying the instinct of curiosity.

In order to prevent boot-licking, de-bunking and similar manifestations of emotion, not forgetting the probable rewards for such base conduct, the poll should be secret. This can be accomplished in two different ways.

The first method is to issue printed questionnaires to the workmen. Something in the nature of a quiz is required. The foreman, on whom judgment is to be passed, does not see the completed questionnaires at any time. The results of the questionnaire are studied and tabulated by a competent statistician, or an impartial person with statistical training, and a digest of the results are passed to some high executive, preferably the one who is in control of the foreman. This executive can then tell the foreman that his standing with his men is very high, fairly satisfactory, or that it stinks.

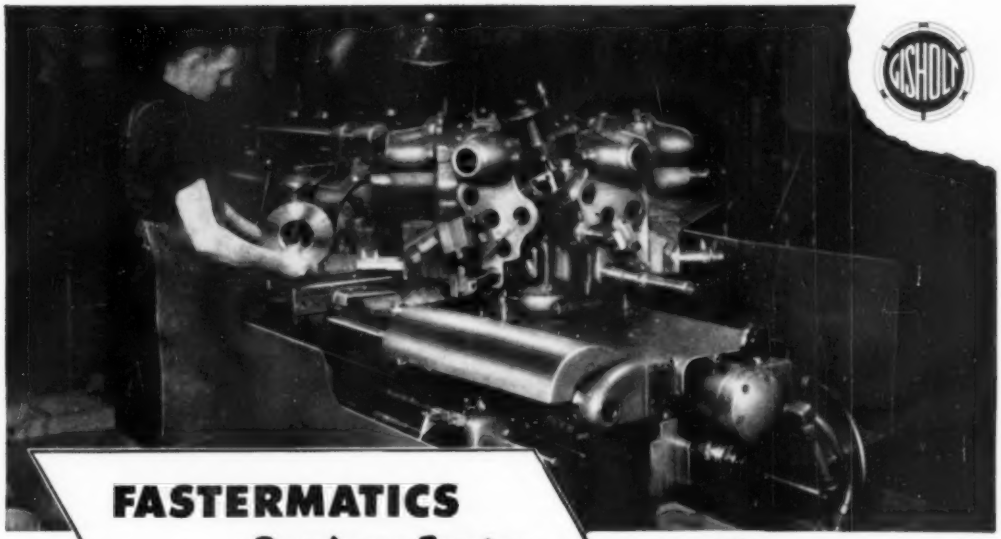
If a foreman who was unpopular was permitted to see the completed questionnaires with names and identity of the compilers clearly indicated, it is in the nature of a human being to react by exacting retribution or, in the opposite extreme, to blow out his brains or throw himself over the nearest bridge. The foreman must know what has been said about him, but he must not know who said it.

The second method of insuring secrecy is to make the questionnaire with a tear-off section. On one section is the name and identity of the one who filled in the questions, which are placed on the other half of the sheet. Each half of the sheet carries a serial number which comprises the only link between the two halves. The name part can be torn off by the person filling in the questionnaire and retained by him, so that the reader of the form has a serial number only as a means of identification. Apart from the possibility of identifying hand writing or printing, the foreman could be permitted to read these completed forms without the danger of finding out the identities of the authors.

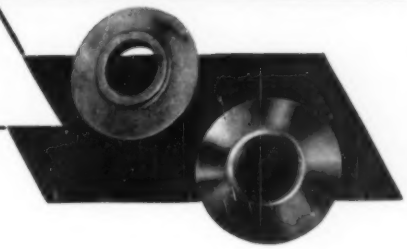
An alternative to the above would be for the workman to complete the form and drop it into a locked box similar to a ballot box. The forms could then be torn apart by the statistician and the name portions retained in a safe place while the main part of the form is handed to the foreman. I, personally, favor the issuing of a digested report by the statistician and letting the foreman see the results only in this form.

The questionnaire or quiz method of compiling the form will yield concrete information if the workman is asked to give only one of three

"I have been asked to present you with this certificate!"



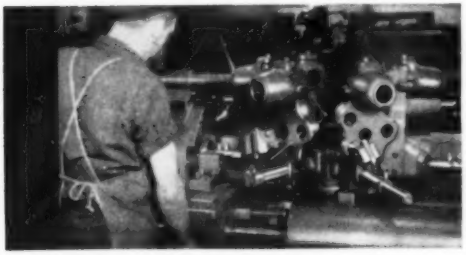
FASTERMATICS
Produce Faster— Pay Off Faster



It may seem incredible, in this day and age, for any major machine tool to "buy" itself in nine short weeks of operation. But that's exactly what the Fastermatic Automatic Turret Lathe did on this job of machining clutch plate hubs.

Former time, on hand-operated turret lathes, was 15 minutes per piece. The Fastermatic, with automatic control of all machine functions, reduced the time to only 3 minutes, floor to floor. Earnings piled up so fast over former production costs that the Fastermatic paid for itself in just 9 weeks—or 893 hours of operation.

Do you have work that permits a number of cuts in one chucking? Investigate the Fastermatics. You may have a big opportunity to increase production, cut costs and save man power.



In this tooling setup, only 3 turret faces are needed to turn each part. With duplicate tooling on the remaining 3 faces of the hexagon turret, 2 parts are machined with each complete turret cycle. The operator merely loads and unloads the work.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Hydroforming

improves the quality of deep drawn parts

CINCINNATI 26"
HYDROFORM

Also built in 12", 19", 23" and 32" standard sizes. Machine size indicates maximum blank diameter that can be formed. Material thickness can range from foils to ⅜" steel.

Write for your copy of Hydroform Bulletin M-1759

Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Here's deep drawing with a kid glove touch!

Pre-polished blanks of 20-gage Type 302 Stainless Steel, having a protective plastic coating over the entire blank surface, were Hydroformed in one operation to produce the Corner Ball shown above. The fact that Hydroforming does not impair the finish of the material is dramatically illustrated here, as these parts are drawn with the plastic coating *still intact!*

CINCINNATI

Deep drawing by the Hydroforming process utilizes a punch working upward into a universal die member—an oil cavity sealed by a flexible diaphragm. Sheet materials are formed to the shape of the punch by controlled hydraulic pressure.

SURFACE FINISH IS UNIMPAIRED

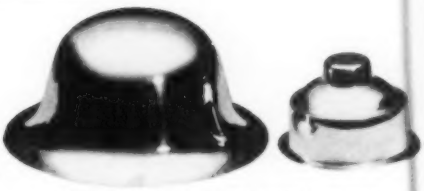
The cushioned action of the flexible die member cannot mar the surface of the material being formed. Parts can be formed *after* the material is painted, plated, lithographed or highly polished.

Conventional drawing methods leave a succession of draw marks on parts produced by two or more draws. The number of draws required to Hydroform a part does not affect the surface finish quality.

MECHANICAL VALUES ARE IMPROVED

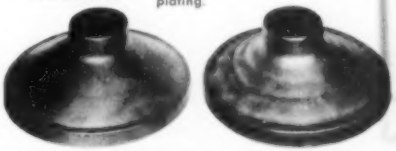
Due to the unique drawing action, Hydroforming retains higher mechanical and physical values in the part. Because the material is uniformly worked during the draw, localized thin-out is either greatly reduced or eliminated. Hydroforming reduces springback, improving the dimensional accuracy of the part.

In addition to substantial savings on secondary finishing operations, Hydroform users report improved part quality—greatly reduced tool costs—savings in materials—reduction in the number of required operations on many parts—less time required between release of drawings and the production of part samples—many other benefits. Can *your* manufacturing program use similar economies? Then investigate Hydroforming *now*—it will change your thinking on deep drawing and forming! Contact your nearest Cincinnati Milling Machine Co. representative for full information.



Sterling silver bowl and salt shaker base Hydroformed without scratching or scuffing the extremely soft surfaces. Very little secondary work is required to produce the lustrous finish.

Cuff Link face of gold-plated brass, Hydroformed after plating.



Note draw marks on part at right, produced by conventional method in 7 operations. Same part at left, produced in 3 operations by Hydroforming, has unmarred surface finish.

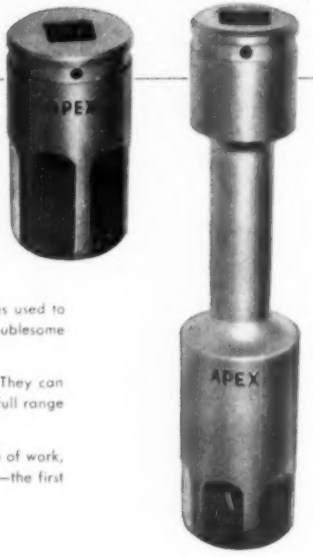
Section of conically shaped Hydroformed part gaged to show reduction of material thickness by forming. Note loss of only 0.005" and 0.0035" in the areas indicated. Identical section of this part produced by conventional method shows from 6% to 25% greater material reduction in same areas.

this is a bull nut

(as any refinery man knows)

and these are APEX Bull Nut Drivers

(that save time and money in many refineries)



Setting and removing bull nuts on preheaters of cracking unit furnaces used to be quite a task. It was, in fact, one of the most persistent and troublesome problems of refinery maintenance.

Not any more. This new series of Apex drivers solved that problem. They can be used with almost any make of power tool, and are available in a full range of lengths and hex sizes to accommodate all standard bull nuts.

They are considerably lighter than the tools formerly used for this type of work, yet they will provide longer service life. Can't tell yet how much longer—the first ones ever built are still in service!

Unless you operate an oil refinery, you probably aren't interested in Apex bull nut drivers. But if you have anything at all to do with nutsetting operations, you'll be very much interested in the many other types of Apex drivers.

Whatever your nutsetting problem, chances are you'll find the answer to it among the thousands of stock types and sizes of Apex sockets, extensions, adapters and universal wrenches. And, if your problem should be very special, just send us a sketch or blueprint and we'll most likely come up with the special solution—just as we did for the oil refineries.

CATALOG 29 is packed with specifications, illustrations and helpful information on the complete Apex line—write, on your company letterhead please, for your copy.

APEX TOOLS

sockets, extensions, adapters

THE APEX MACHINE & TOOL COMPANY

1026 S. Patterson Blvd., Dayton 2, Ohio

POWER BITS, INSERT BITS AND BIT HOLDERS, FOR PHILLIPS, FREARSON (Reed & Prince), SLOTTED, CLUTCH HEAD and SOCKET HEAD SCREWS • HAND DRIVERS FOR PHILLIPS, FREARSON AND CLUTCH HEAD SCREWS • TWO-PIECE DRIVERS FOR HEX HEAD SCREWS • SOCKETS, EXTENSIONS, ADAPTERS AND NUT SETTERS • UNIVERSAL SOCKETS, EXTENSION WRENCHES AND ADAPTERS • AIRCRAFT AND INDUSTRIAL UNIVERSAL JOINTS • SELF-RELEASING AND ADJUSTABLE STUD SETTERS • SAFETY FRICTION TAPPING CHUCKS • VERTICAL FLOAT TAPPING CHUCKS

possible answers. These can be "yes," "no," or "don't know;" "very good," "fair," and "poor." Another good way is to give 10 marks for perfection, then to allow the workman to put any number in the space alongside the question. With numbers, an accurate result can be compiled as it is a simple matter to add them up.

Clear and definite information will not be obtained from the poll unless one of the above-described methods of scoring is used. It is also advisable that workmen have privacy when filling out the questionnaires so that they cannot discuss their findings with one another. One thing is certain, the foreman should neither distribute nor collect the forms to be used. This should be done by some person completely detached from the production shop. Alternatively, the ballot box is the best idea.

One good reason why a high executive only should know what the poll has revealed is to enable action to be taken in the event that the foreman is shown by the poll to be unsatisfactory. By keeping the results secret, the executive can tell the foreman anything he thinks is expedient to keep him quiet, while he thinks over the next step to be taken.

It is obvious that a foreman who is less than fifty per cent satisfactory should be removed. The executive is then placed in an awkward position, but as it is his job to make decisions on matters of policy, it is for him alone to decide whether he will ignore the results of the poll or act upon them.

It is not a good idea when com-

"Wife's pastry improves with every batch."

Rolling Large Diameter Threads on 5" Rocket Motor Nozzle

REED

Threading 4 to 6 Parts per minute

The Reed Thread Roller has overcome major threading problems in the producing of 4¾"—12 threads on 5" Rocket Motor Nozzles. With the previous production methods, difficulty had been encountered in obtaining squareness and 100% inspection was required for accuracy and smoothness.

The Reed A32 Cylindrical Die Thread Roller produces accurate threads that are much smoother and have a high degree of surface finish. Squareness of the thread with the shoulder is held to within one-half of the required tolerance with simple tooling. Production is at the rate of 4 to 6 threaded parts per minute.

Only spot checking of the threads is now required, and inspection costs have been reduced over 65%.

Send us specifications of your requirements and let us supply you with complete information.

REED ROLLED THREAD DIE CO.

Manufacturers of

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS

Worcester, Massachusetts, U.S.A.

AM-625

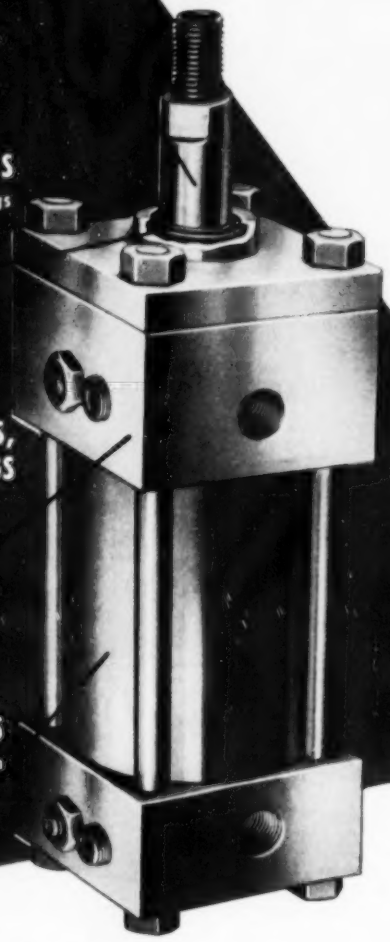
Miller - AIR CYLINDERS

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

BRASS BARRELS
Eliminate Rust and Corrosion



FOUR WEEK DELIVERY
(dependent upon your allowing us more time on non-rush orders)
to meet your *RUSH* cylinder requirements
on all Standard Models except

Models 81 and 82	6 weeks
Water Fitted Models	7 weeks
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MET J. I. C. PNEUMATIC STANDARDS years before their adoption in 1950.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

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piling the question for to give space for "additional remarks." The temptation to the workman when using such a space is too great to be resisted and he will fill it up with emotional statements which may detract from the firm answers which he has had to give in answer to specific questions. The questions should be compiled carefully so that the information required may be brought to light in a decisive fashion.

Clifford T Bower
London, England

•

THERE IS no question that men do usually rate their boss. However, how vocal this rating is varies greatly, as well as the effect of the rating. Usually only in extreme cases is much heard about it.

I believe the majority of men would decline stating just how valuable they consider the boss.

The superintendent should know the value of both the workmen and the foreman by mingling with both as much as possible.

Any report that workmen make whether oral or written, is very apt to make unpleasant feelings. I do not think it an advisable way to get the value of a boss to a higher authority, but would advise that the superintendent or the next one higher in authority have the responsibility of judging the boss, or by having each workman deposit a card, as per sample, in a battle box with check marks on it, but without signature.

H B Martin
Watervliet, NY

BALLOT

Your opinion of your boss.....
Capable .....
Unpleasant .....
Gruff .....
Pleasant .....
Does not explain sufficiently.....
Hard to get his attention.....

Fill in the line that fits your foreman's disposition with a mark [X] but do no other writing and do not sign.

•

WHILE THE men may be perfectly capable of "rating" the foreman in more ways than one, I am of the opinion that this function should be left to his immediate superiors for reasons which should be fairly obvious to anyone who has been a foreman or an employee. First of all, the foreman is a direct represent-

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ative of management and has been selected as the man best fitted to keep production at the highest possible peak in his department.

In order to do this, he has to assume the responsibilities of leadership, one of which is the maintenance of a certain amount of discipline which usually does not endear him to the individual who has to be disciplined, no matter how deserving of the boss's strictures he may be. We all know that the average shop contains a cross-section of humanity at large; there is the individual who will cooperate to the fullest extent, and from him a gradual scaling down of the spirit of cooperation. The cooperative individual or individuals, if the foreman is lucky, needs very little supervision to operate at peak efficiency. With the other 90%—and I think I am being conservative—the foreman really begins to earn his salary.

Assuming that the foreman possessed the gift of being infallible, there would be those among the employees who cherished the secret notion that they could do a better job than the present incumbent, and wouldn't hesistate to mark their rating card with that thought in mind.

Then, of course, there is the type of individual who hesitates to do anything that might savor of criticism of the powers that be, and would mark this card with an A-plus for the foreman. In short, going down the line, I doubt if any of the rating cards would produce anything of constructive value for the foreman or management. If we are to assume that these cards have to be marked on company time, then their value would be still more questionable.

Last, but not least, without being

"I told the boss I wanted to see something a little greener in my pay envelope this week and he put a tube of chlorophyll toothpaste in it!"

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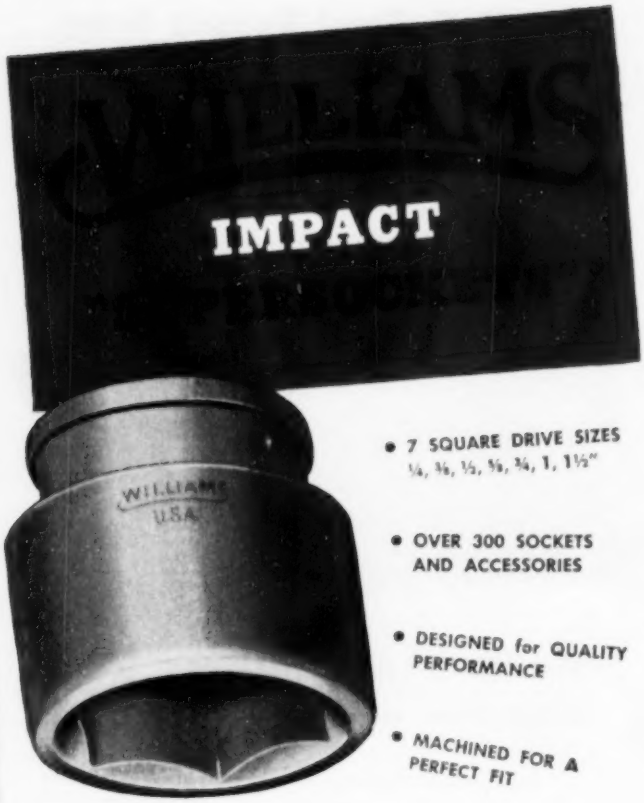

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stuffy about it, there is the matter of prestige. No man likes to feel he is above criticism, yet is entitled to believe that his knowledge and ability are such as set him apart from his fellow-workers, and recognized by management to the extent that he was promoted to direct their efforts. I say, if the foreman has to be rated, let him be rated by the people who selected him from the ranks.

In the final analysis, results are the true yardstick of performance. If management looks at the production reports and sees that a foreman's department is consistently lagging, something drastic will be done —and it won't be done by employee-rating cards.

Robert S Alexander
Greenville, RI

•

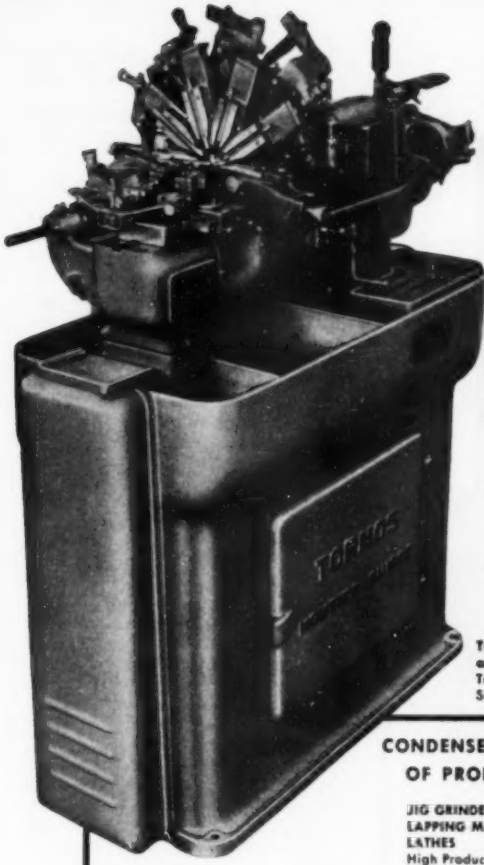
CAN A MAN STEP DOWN?

MEN CAN and do step down for various reasons, but in very few cases do they step down willingly. In the case under discussion we have an instance where the demotion, while merited, is going to be taken most unwillingly.

If I were in Al's shoes, with definite proof of Bingham's disloyalty, I would see to it that if demotion was the harshest penalty meted out to the offender, he be demoted to another department. It is a safe bet to say that if you can't trust a man as an assistant in your department, he is certainly not going to work for you wholeheartedly when demoted to the bench or machine. In fact, I doubt whether Bingham deserves consideration as a company asset. For his own good I think it would be better if he were let go and allowed to start fresh somewhere else. At any rate his prospects for advancement might not be so dim; very few supervisors feel like taking a chance on someone who has earned a reputation for wielding the knife.

It is no crime to be ambitious. On the contrary, ambition honestly harnessed to industry is to be commended and admired. When a man attempts to further his interests by undermining his superior, by whose grace he was given a chance to further his ambitions honestly, then he has no right to feel aggrieved if his fellowmen regard him with suspicion and contempt.

In the final analysis, I feel that men of the Bingham type are a detriment to any organization, as no one will cooperate with them, and without cooperation the best or-



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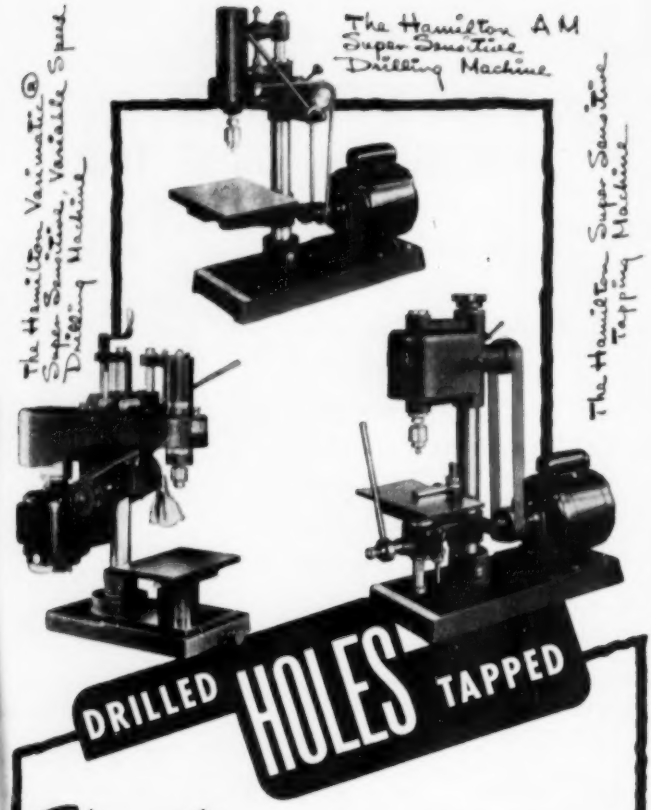

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ganization must wither and die. The remedy is obvious and simple—weed them out!

Robert S Alexander
Greenville, RI

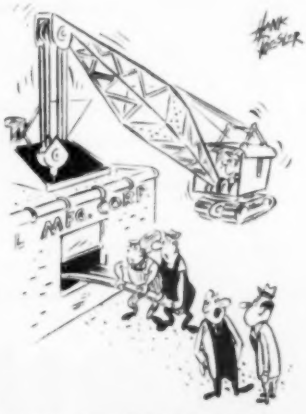
•

THE QUESTION POSED here asks what happens when a man is demoted. If this happened to me I would resent it, as my pride would be hurt. A thoughtful person in a supervisory or management position would realize that *any* person demoted would feel the same way about it, hence demotion is not advisable except possibly as a definite reprimand.

If Bingham, the object of our attention in the story, is known to be undercutting his boss, and we assume this means he wants his boss's job, it is safe to say Bingham lacks a sense of gratitude, can't be trusted to be loyal, places his ambition above all else, and does not have a mature character.

Al, watching developments closely, might arrive at this conclusion himself, and could tell an associate to give Bingham a hint as to proper conduct, in order to give the man a chance to straighten out. After all, Bingham must have something, or he couldn't have been selected, thus he deserves some consideration. If this didn't work, Al could give Bingham enough rope to hang himself, and so deserve a demotion.

If Al couldn't go through all this bother, for one reason or another, he could gracefully shove Bingham on some side track, just to get him out of the way. Bingham, apparently being somewhat selfish, could even betray his employer, as well as his



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ADAMAS Grade D proved most successful in trepanning Air Force Fitting

PROBLEM: Trepanning a groove 7/16" wide x 2-3/16" deep in a 5" diameter fitting for the U. S. Air Force maintaining 125 micro-inch finish in a semi-finishing operation holding a .005 tolerance on a Warner-Swasey #5 Turret Lathe.

MATERIAL: WD 4140 steel forging heat treated to Rockwell 35-40 C, PSI 140-190,000.

SOLUTION: After an extended analysis it was found that ADAMAS Grade D gave excellent performance and long tool life.

With the aid of Adamas Carbide, the Iron Fireman Manufacturing Co. of Cleveland, Ohio was able to complete this job on schedule with maximum efficiency. This is another working application of Adamas job-engineered grades.

Specify **"ADAMAS"** on your carbide tool prints, and gain the advantages of finest quality, service and performance.

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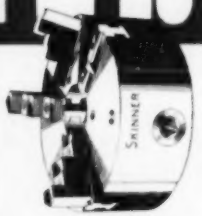
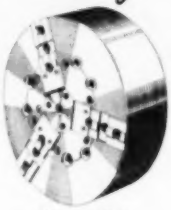


quality

SCROLL CHUCKS Self-centering models for light, medium and heavy duty jobs in tool room or for production runs. Available in sizes from 3" to 18" with semi-steel or forged steel bodies, and heat-treated alloy steel for all other parts. Provided with two sets of solid jaws or two-piece jaws for holding internal or external work. Lands on the jaw, jaw steps and end bites are ground after the chuck is assembled.

accuracy

INDEPENDENT CHUCKS Models for medium and heavy duty tool room and general machine shop work. Available in sizes from 4½" to 36" with semi-steel, steel, or forged steel bodies. All other parts are heat-treated alloy steel. Jaws are solid reversible or two-piece with reversible tops for either internal or external gripping. The body surrounds more than 60% of each operating screw for the full length of the screw to assure proper alignment at all times.



long life

AIR & POWER CHUCKS Self-centering models for heavy duty production work on engine and turret lathes and automatics. Sizes from 6" to 24" with forged steel bodies, and with either 2 or 3 jaws are available. The wedge angle is such that work is gripped positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar. Skinner also has a complete line of power chucking accessories.

positive grip

MACHINE VISES Skinner vises are accurate, fast acting and positive gripping. Series DFV wrench-operated Vises have semi-steel body and hardened and ground work holding surfaces. They have all the universal features so necessary for drill press operations. Clamp the work for drilling in one plane — drill — turn the vise on edge for all right angle drilling operations.

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Details on the full line of products are included in Skinner General Catalog — write to the company or your nearest Skinner distributor for a free copy!

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Chucks - Vises

immediate supervisor, just to further his own ends.

Al wouldn't necessarily lose face if he demoted Bingham or sidetracked him; it would be to Bingham's discredit. After all, any man promoted or given a new job is on probation for a while. He's got to show whether or not he has got what it takes to succeed.

In my outline of the solution, Al might solve his problem.

Edward Diskavich
Torrington, Conn

Tangents by Tange

A non-engineer who has been studying mechanization made a good point when we talked with him recently. There are two steps to shifting from a handcraft to a mechanized process:

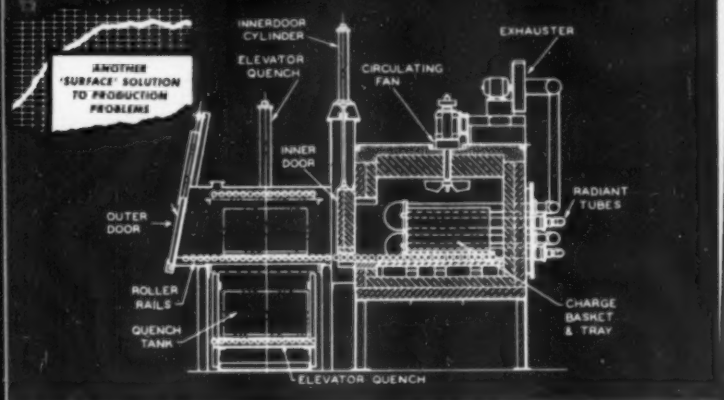
Step I: Produce mechanical motions that do what hands did before. Hat making, chicken plucking, and much of "automation" is in that stage. We Americans are particularly skilled at Step I, more so than any other nation.

Step II: Develop the best mechanical way to do the job, whether or not it's traditional. Examples in Metalworking are shell molding, electroforming, cold extrusion. This takes straightforward analysis of the job to be done, by a mind unhampered with too much knowledge of the accepted process. We Americans aren't too good at that. The Germans, in particular, are better at it. Once they've gotten the new idea, however, we're better at developing it.

Our tendency is too often to improve and improve a process instead of deciding whether or not it's the ultimate one. Look how much trouble we had shifting from thinking in terms of castings to thinking in terms of weldments. All early weldments were merely copies of castings. And all early automobiles were buggies with the horse under the seat—or behind it.

Reminds us of the story of the whipsocket maker who made his product better each year, and produced it more economically. That's a surefire formula for success—usually. But somebody else came along

'Surface'



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Enclosed Liquid Quench, atmosphere-protected; propeller type agitation and mechanized quench provides rapid direct quenching.

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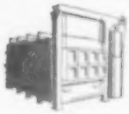

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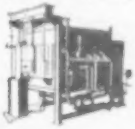

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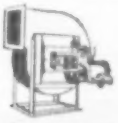

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and invented the automobile. We used that story before—and it won't hurt to look at the article which went with it (*AM* June 9 '52, p 143-146). That author had the same idea we're trying to express here—that before you improve handling between operations you study carefully to see if the operations themselves are necessary.

But to go back to our original point: Be sure somebody occasionally thinks of Step II in developing processes. Maybe the best way to develop is to discard in favor of a new, better, and cheaper method. The signal that you've found it is always this exclamation:

"It's so damned simple, why didn't somebody think of it before?"

That one is easy. Nobody ever got far enough away from those particular trees to realize he was in a forest.

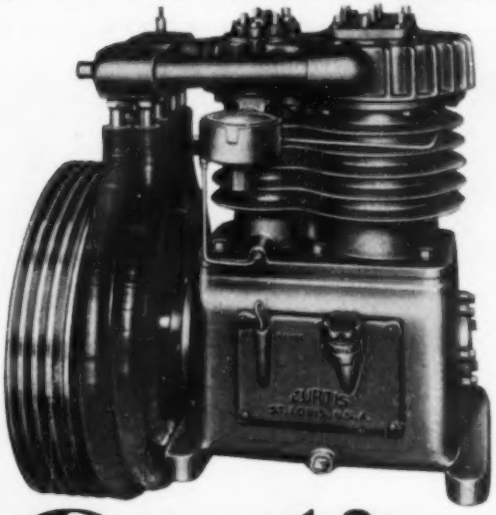
We got talking, with the same disinterested observer, about the decline in worker skill—really not a decline as much as a disinclination. The worker, in mass, just isn't interested in becoming really skilled at anythnig. Meantime, his wage rate mounts so high that his employer is driven to providing a machine that can do the job faster. Then that brings on union troubles.

Our friend offered the opinion that the skill is still there, but it's being diverted to the home. He feels there's a tremendous increase in the number of men doing their own home maintenance, building their own spare bedrooms, fixing their own plumbing, adding their own baseboard outlets. Ironically, the reason is the same as their boss' for

"I wish they'd keep that door closed—I feel a draft!"

MORE AIR Per Horse Power

- IT'S TWO-STAGE
- IT'S AIR COOLED
- SELF OILING



The New Curtis

MODEL 98 AIR COMPRESSOR

TWO-STAGE AIR COOLED 15 AND 20 HORSEPOWER

TWO-STAGE — More air per kilowatt hour, assuring savings in power bill.

AIR-COOLED — No expensive water bills; eliminates plumbing installation costs.

INTERCOOLER — Four section, finned, providing unusually effective cooling between stages; cooled by cyclone of air from fan flywheel.

SELF OILING — Simple, positive centro ring method; provides pressure lubrication of connecting rod and piston pin bearings.

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PRECISION WORKMANSHIP — Assures long life and minimum maintenance.

EXPERIENCE — Backed by 99 years of manufacturing — assures you dependable, troublefree service.

Available as a simple compressor or base mounted — motor driven.

LET ONE MAN DO THE WORK
with this Curtis air-operated equipment.

AIR CYLINDERS — for almost any pushing, pulling or hoisting operation.

AIR HOISTS — for low-cost lifting or lowering of materials or machines.

-726

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of Curtis Manufacturing Co.
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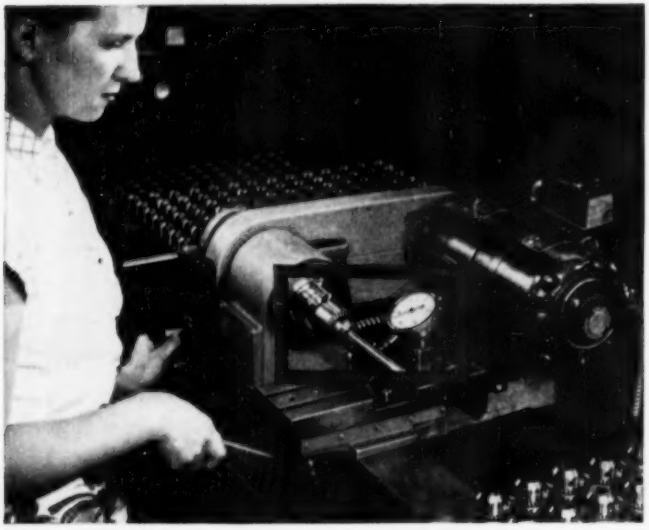

no guesswork . . .
precision manufacturing and finest materials assure DEPENDABILITY!

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Every Supreme brand chuck is mechanically checked for accuracy . . . there is no guesswork in this inspection that assures you of a precision product. It is just part of the careful manufacturing that enables us to present this new Supreme chuck as both dependable and accurate. The best way to appreciate it is to try it . . . ask for Supreme brand chuck the next time you order.

SUPREME BRAND CHUCKS

Supreme Products, Inc., 2222 South Calumet Avenue, Chicago, Illinois

THE CHUCK THAT LIVES UP TO ITS NAME...SUPREME

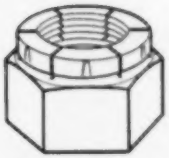
putting in a new machine—labor costs too much.

We think there's more to it than that. Part of it is restlessness and uncertainty about the future, brought on by wars and rumors of wars, particularly the terrible finality of A-bombing. Part of it, and highly contrasting with the fear of sudden destruction, is a feeling that there's little reason for pushing—if you get sick, the State will take care of you, and when you get old, the Federal Government will. Besides, if you do start a business, you'll be snowed under by tax forms and all the tribulations of business. Lastly, there's the desire to be one of the mob. For some centuries, while we were supposed to be democratic, we weren't; we were a stratified society, in which common labor tipped its hats to skilled labor, which tipped its hats to capital. Now, when we are supposed to be slipping into a socialistic state, everybody decides to be democratic. It's all very confusing, and the reason we prefer engineering to politics.

Still, there are, and always will be, those independent souls who go on thinking up new ideas. Just when everything closes in on us, there's always somebody who comes rushing out, yelling "Eureka! I've found it!" And found it he has . . . so we all settle down and go back to work.

Reminds us of the story of the *Bon Homme Richard* and the *Serapis*. The commander of the latter had reduced the *Richard* to a blazing hulk; there was only one gun that could fire. Just as the gunner, bleeding from a dozen wounds and practically out on his feet, was about to touch off that piece as a last gesture of defiance, John Paul Jones sprang out of the cabin, shouting, "We have just begun to fight!"

"Who's the new one Joe-?" Remember the guy with the art gallery?



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Just what are these Flexloc nuts?

"They're nuts that lock and stay put on a bolt. Once you install them, you can forget them. They sure save a lot of time in maintenance. Let me show you just what I mean. This shuttle assembly is fastened together with FLEXLOC *Self-Locking Nuts. We haven't had to put a wrench on it since we installed it."*

When nuts work loose, you're in real trouble. Machinery is often damaged and stopped. Production suffers, deliveries lag, and you lose money. But there's a sure way to keep nuts where they belong. Specify and install FLEXLOC Self-Locking Nuts.

FLEXLOC locknuts have higher tensile strength than most other locknuts. They're not affected by temperatures to 550°F. And because their torque is controlled within such narrow limits, they have been used successfully on plastic studs.

Increased capacity now enables us to make quantity shipments of FLEXLOC locknuts in a wide range of sizes. Write for literature, and samples. STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

FLEXLOC LOCKNUT DIVISION

sps

JENKINTOWN, PENNSYLVANIA

How We Take CHANCE OUT of Alloy Buying

Here's a spark tester checking bars of Ryerson alloy steel. By reading the spark pattern thrown off when each bar is touched with this whirling, abrasive wheel, the tester determines the steel's analysis. In this way he verifies quality—guards against mixed steels.

Spark testing is only one of many steps in the Ryerson Certified Steel plan for safer alloy buying—a plan especially important to you today, while restrictions are enforcing the use of leaner alloys with unfamiliar heat treatment response.

We also put every heat of Ryerson alloy steel through four separate hardenability tests, carefully recording the results on a Ryerson Alloy Certificate which goes with the steel. These tests enable you to buy Ryerson alloys on the basis of hardenability as well as analysis—the safest way to buy under today's changing conditions. And the recorded test results safely guide your heat treatment. So play safe. Order from Ryerson where you can specify hardenability and be doubly sure. Stocks are out of balance from a size standpoint, but in all probability we can take care of your requirements.

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CARBON STEEL BARS —hot rolled and cold finished
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ALLOYS—Hot rolled, cold finished, heat treated
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The gunner dropped his match, and wiping the blood from his eyes, said disgustedly, "There's always somebody who hasn't had the word."

It's that "somebody" who hasn't gotten the word that saves our hide time and again, "somebody" who doesn't know it can't be done— and does it. —TANGE

"Bring me men to match my mountains,
Bring me men to match my plains,
Men with empires in their purpose,
And new eras in their brains."
—S W Foss

NEW BOOKS

READINGS IN INDUSTRIAL AND BUSINESS PSYCHOLOGY—*By H W Karn and B von Haller Gilmer, professors of psychology, Carnegie Institute of Technology. Published by The McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N Y. 476 pages. Price $4.50*

The authors have selected 53 recently published articles to produce a text that is intended to supplement comprehensive treatments of the subject. It is particularly useful, therefore, for courses in which the instructor provides continuity through lectures or other texts. Articles were selected to represent current trends in thinking on important topics such as, morale, training, job evaluation, employee testing, accidents and safety, interviewing, fatigue, leadership, and human relations in industry. They also were selected for contributing concrete solutions to problems in these areas and for writing style that discusses psychology in terms that can be understood readily by the practical businessman.

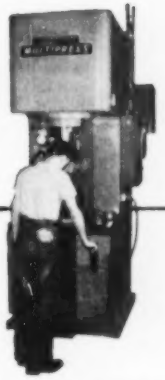
•

INDUSTRIAL FILM BIBLIOGRAPHY—*Prepared by National Metal Trades Association, 122 S Michigan Ave, Chicago 3, Ill. 8½x11 in. 100 pages. Price: $1 to association members, $2 for non-members.*

This is the third edition of the film bibliography, which includes a complete revision of the second (1949) edition, and additional listings of 345 new films. Motion pictures and filmstrips available for educational purposes are listed by subject matter

G-E Report Verifies Advantages of Hydraulic Presses

. . . Added Proof that MULTIPRESS® CUTS COSTS on ASSEMBLY



More proof that the right use of hydraulic pressure cuts staking costs several ways! General Electric's own experience with Multipress, in their Meter and Instrument Division, echoes gains reported by dozens of other users.

With Multipress, ram speeds and pressures are closely adjustable to each different job need, and are *automatically controlled* for continuous accuracy. This eliminates the need for skilled operators.

In addition, Multipress does the work *without sudden impact.* Working pressures build up *after* tooling contacts the parts. Among other advantages, this cuts tool wear and ends a major cause of tool damage.

But Multipress assures even bigger gains in reduced scrap losses, because its smooth action lets metals "flow" into place without losing their normal tension characteristics. At G-E, scrap on staking operations had often run from 5 to 25 per cent. Multipress cut these losses to *one per cent or less.*

Ease and safety of operation—plus quietness—are added Multipress features. And most Multipress advantages apply also to many other production jobs—bending, drawing, flaring, stamping, forming, blanking, riveting, and so on.

Write today for full information on Multipress and its many accessories for special needs.

Multipress offers 8 frame sizes. Capacities range from one-ton to the 50-ton unit shown directly above. Model at upper left, equipped with Multipress Index Table, automatically rotates parts under press ram. Note handy storage of parts at center of table dial.

The Multipress "Midget" offers one-ton capacity.

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1164 Dublin Road, Columbus 16, Ohio

DENISON HydrOILics

BALANCED POWER

Meeting today's demands for faster, more economical production requires presses of balanced power—rigid, rugged presses, perfectly controlled, that will stand up under rapid, continuous operation. Federal Presses meet these requirements. Built of finest materials, all working parts are carefully machined, fitted and aligned to provide balanced power throughout their operating range. Sizes 6 to 80 tons. Also dial feeds. Write for catalog.

and by title. Coded references indicate whether the film can be bought, rented, or borrowed, film size, silent or sound, where the film can be obtained (multiple sources, where they apply, are given), and short reviews are appended.

The index is a fairly complete listing of films for industrial use, and includes few films not usable by viewers in the metalworking industry. As a sample of what's available, there are listings under all the basic metals, primary metal-cutting processes, and the common types of mechanical products.

•

PERSONNEL ADMINISTRATION—*By William W Waite, associate professor of industrial engineering, Columbia University. Published by The Ronald Press, 15 E 26th St, New York 10, N Y 683 pages. Price $7*

Providing a comprehensive description of basic personnel activities, this text relates the fundamentals of personnel functions to actual shop problems. The author draws from his experience in industry, in consulting work, and in teaching, to develop a book that is practical and useful. It is well suited for student and classroom work, containing discussion questions and a host of references. It also could be a valuable reference for supervisors and personnel people.

Topics discussed include starting a personnel program, recruitment, induction, training (including supervisory training), job evaluation, wage administration, working conditions, safety, merit rating, transfer, discharges, absenteeism, employee-benefit programs, and problems of collective bargaining.

•

FATIGUE AND FRACTURE OF METALS, A SYMPOSIUM—*Edited by William M Murray, assoc prof of Mech Engrg, MIT, with a foreword by Jerome C Hunsaker, prof of Aeronautical Engrg, MIT. Published jointly by The Technology Press of The Massachusetts Institute of Technology and John Wiley & Sons Inc, 440 Fourth Ave, New York 16, N Y. 313 pages, 5¾ x 9 in. Price $6.*

The fourteen papers that make up this book were presented by specialists in the different aspects of fatigue and fracture of metals at a special conference on the subject given in June 1950 at MIT. Covered in this discussion are: general experiences with failure of metals;

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HERE's a remarkable new grinder that sharpens small twist drills with amazing speed and precision. Enables you to do away with expensive machine shop maintenance of 2-lip drills—No. 70 to ¼".

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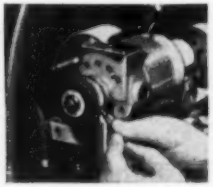

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"DIE-LESS DUPLICATING" SAVES TOOLING COSTS, SPEEDS PRODUCTION

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HARD CHROMIUM PLATING can salvage machine parts. Worn bearings, scored shafts, flat surfaces—plating .100" thick has been successfully applied. Shorter down time; a harder, more perfect anti-friction bearing than on original equipment.

Send a sketch of your problem, and we will advise you as to the possibility of using HARD CHROMIUM PLATING as a method of salvage.

SMART DESIGNERS IN BOTH GOVERNMENT AND PRIVATE INDUSTRY ARE USING HARD CHROMIUM PLATING AS A SURFACE FINISH IN NEW DESIGNS.

THE INDUSTRIAL PLATING COMPANY

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specific fields in which it occurs; the internal mechanisms probably involved in fatigue damage; significance of various metallurgical phenomena to fatigue; potential usefulness of different research methods to disclose more about the mechanism itself and about ways of countering it in design; and the direction of future research.

The purpose of the book is to serve as a survey of existing knowledge and expert opinion to aid designers in creating safe structures and machines of better performance and longer usefulness.

•

REPORTS OF THE IRON AND STEEL COMMITTEE: *Fourth Session, Geneva, 1952 (paper-bound, 6x9). Published by the International Labor Office, Washington Branch, 1825 Jefferson Place, NW, Washington 6, DC Price: $1.50 per set*

Report I: General Report, 106 pages—devoted primarily to industry development and modernization plans in 35 countries and to employment figures for each. Also discusses industrial and international cooperation.

Report II: Vocational Training and Promotion in the Iron and Steel Industry, 94 pages—discusses methods currently in use in a few countries and provides data for comparing technical requirements in the main trades. Includes material on selection of men for supervising positions, merit rating, upgrading, seniority, and transfers.

Report III: Welfare Services in the Iron and Steel Industry, 80 pages—presents points of similarity and of difference between important welfare provisions made by industry in various countries. Contains one main chapter devoted to the workplace, and a second discussing general social welfare. A third chapter discusses communications and administration relative to services, while a fourth presents conclusions.

•

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION 1951—*Published by the US Government Printing Office, Washington 25, D C. 449 pages. Price $3*

Under this heavy and ostentatious title there lies a good package of interesting and unusual material for the inquiring mind—not necessarily engineering, but scientific material about the world around us.

What do you do when your v-belts get loose or break?

1 **Leave the drive alone**

You get more slippage
...wasted power
...excessive belt wear
...uneven sheave wear
...less production

2 **Slide the motor back**

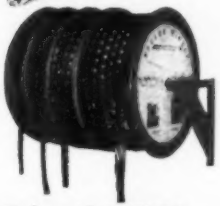
Tight belts get too tight

Life of belts and bearings is reduced

3 **Install a new set of belts**

Discarded belts mean wasted money

4 **Use VEELOS...**



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the adjustable v-belt—can you get *all* these operating advantages. And *only* with Veelos can you eliminate costly v-belt inventory because just four reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts.

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The plain facts on construction, installation and use of Veelos are included in this illustrated Data Book —write for your copy.

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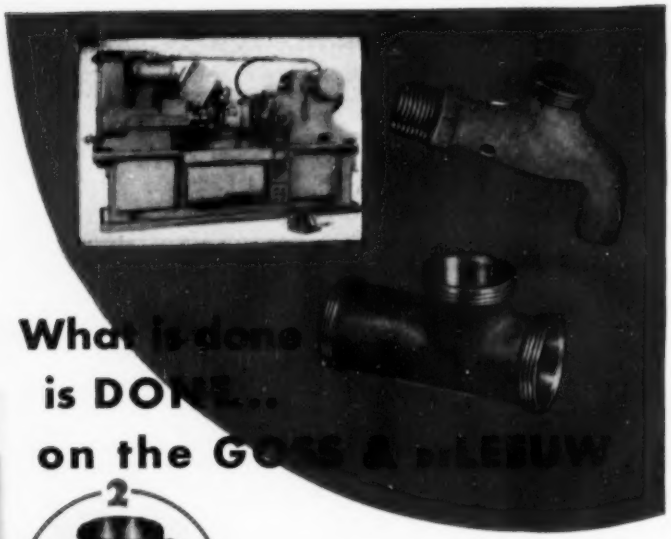
Link construction permits quick installation
Easy adjustability
...provides controlled tension on each belt
...eliminates loafers
Keeps your machines running for *profitable* production

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.



What is done
is DONE...
on the Goss & DeLEEUW

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW

GOSS *and* DeLEEUW
MACHINE COMPANY, *KENSINGTON, CONN., U.S.A.*

This year's report, bound in buckram, has text and illustrations on cloud seeding, industrial atomic energy, electronic prospects, ultrasonics, the mechanics of snakes, and artificial lighting in America, among others. Continuing the Smithsonian's yearly habit of telling—tardily but interestingly—what goes on in the world of science and investigation, the book covers the ground of recent discoveries, inventions, and standards of knowledge. It's the kind of book many would like to skim quickly when received, read in parts in detail, then slip into a library shelf for later—and frequent—reference. Although the technical language, where necessary, is explicit, all of the material is written well enough to be easily read by anyone of high-school education.

•

ELASTICITY IN ENGINEERING — *By Ernest E Sechler, Ph D, Professor of Aeronautics, California Institute of Technology. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N Y. 419 pages, 5¾ x 9 in. Price $8.50*

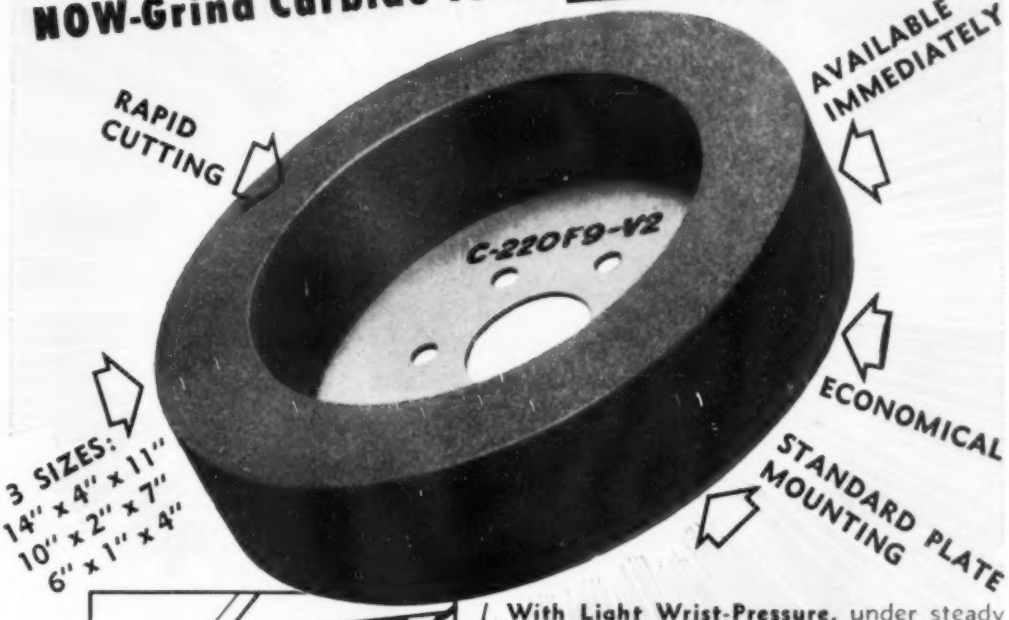
This book was written primarily for engineers working in all fields of structural analysis and is of value for use in undergraduate and graduate courses in applied elasticity and advanced strength of materials. It brings into one volume the material of most interest to the engineer who needs a broad foundation based on the fundamental theories of stress and deformation of elastic bodies under load.

The first section of the book establishes the equations and assumptions underlying the whole field of elasticity and collects the basic equations in Cartesian, cylindrical, and spherical coordinates which must be used for the solution of elastic problems. By application of these fundamental equations the solution of any specific structural problem can be obtained; or it can be arrived at by the use of approximate methods.

The second section illustrates the use of these principles in solving problems of stable (non-buckling) structures and the third section covers instability problems. The last two sections discuss approximate methods of solving problems too complex for formal proof. A number of examples and class problems are contained at the end of each chapter to illustrate the principles being studied.

GOOD NEWS!

NOW-Grind Carbide Tools WITHOUT Diamonds



With Light Wrist-Pressure, under steady coolant flow, these BAY STATE wheels:

1. ***FINISH-GRIND*** **CARBIDE SINGLE POINT TOOLS.**
2. **CUT AS FAST AS DIAMOND WHEELS.**
3. **CUT COSTS TO A MINIMUM.**

IMMEDIATELY AVAILABLE FROM STOCK, these new BAY STATE specifications have been especially developed to help you meet the present and continuing diamond shortage.

TO KEEP PRODUCTION GOING
TO SAVE HARD-TO-GET DIAMOND WHEELS
TO KEEP CARBIDE CUTTING EDGES KEEN

Take advantage of Bay State's Advanced Engineering.

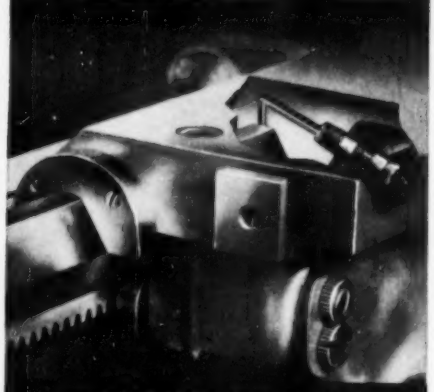
BAY STATE

ORDER A TRIAL WHEEL TODAY

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.

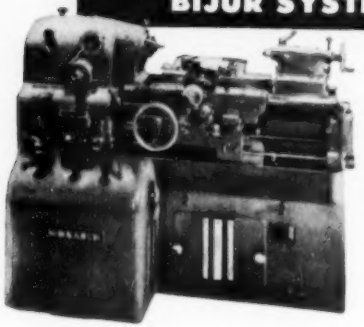
Branch Offices and Warehouses: Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

How to LUBRICATE A HORIZONTAL 'V' WAY



as MONARCH does it with a **BIJUR SYSTEM**

View thru the carriage of a small Monarch Toolmaker's Lathe showing drilled passage from meter-unit to bed way.



In this application, the problem was to maintain a film of oil between the carriage and bed way contact surfaces. It is solved by drilling thru the carriage to an outlet above the "V" way . . . controlling the oil flow thru a meter-unit at the drilled passage . . . supplying oil to this point from a built-in lubricator (actuated by a turn of the apron handwheel) which also oils the cross-slide dovetail and the apron bearings. This is another example of Bijur "teamwork for bearing protection." For aid in solving your lubrication problems, call in a Bijur engineer.

871

BIJUR

LUBRICATING CORPORATION

Rochelle Park, New Jersey

NAMES in the NEWS

C A Walmsley has been appointed district manager in charge of the St Louis car plant of the American Car & Foundry Co, succeeding **T G Shipley**, retired. Mr Walmsley, who joined ACF last year as a production staff specialist, was formerly works manager for a division of Dresser Industries in Marietta, Ohio. **Louis G Raiche** has been named works manager at the St Charles, Mo, plant; he was formerly associated with Curtiss-Wright Corp, Wood-Ridge, NJ.

E W Ristau has been appointed director of sales and advertising, and **John Stolarz** has been named sales manager of the Delta Power Tool Div, which comprises Rockwell Tools, Inc, Deluxe Saw & Tool, and Delta Tools. Prior to joining the firm last year as general manager of Rockwell Tools, Mr Ristau served as vice president of Cummins Portable Tools Div, Cummins-Chicago Corp. Mr Stolarz for the past year has been serving as assistant sales manager of Delta.

Jackson Kemper has been appointed general manager, Watson-Stillman Fittings Div, H K Porter Co, Roselle, NJ. Mr Kemper will be responsible for all operating and sales activities of the division, formerly known as the Watson-Stillman Distributor Products Div, of which he was sales head.

J Roy Knox has been elected vice president, US Div Sales, US Radiator Corp, and **E J Grady** has been named vice president, Pacific Boiler Div Sales. Mr Knox has been general sales manager of the US Div for the past three years, and Mr Grady has been serving as Pacific sales manager since 1946.

James E Woodall has been appointed staff aide to the vice president in charge of the Westinghouse Lamp Div. Mr Woodall, who has been manager of the division's plant at Fairmont, W Va, for the past three years, was previously manager of the company's lamp-base plant at Belleville, NJ. In addition to his appointment, he will also assume the duties of the late **Robert F Tucker** as quality control officer. **Harry A Holden**, manager of the Paris, Texas, plant, has been named staff assistant to the manager of the Feeder Div.

Another great new DISSTON product

Diss-Croloy CIRCULAR SAW
for non-ferrous metals and plastics

Here's a new saw designed to give more cuts per saw dollar. It is carefully made from tough, high-carbon, high-chrome Disston steel . . . with edge-holding qualities superior to any steel saw heretofore available.

Diss-Croloy Circular Saws have a longer cutting life, and require less frequent sharpening...minimizing downtime losses. This means more and better cuts from each blade, with a considerable reduction in sawing costs.

The new Diss-Croloy Circular Saw is made in 6″, 8″, 10″, 12″, 14″, and 16″ diameters. You can use it to cut any non-ferrous metal (such as copper, brass, aluminum, magnesium, bronze) or plastics (as Formica, Masonite, Lucite, Plexiglas, Micarta). Give one of these amazing, economical saws a trial. You can count on them for better quality, higher production and lower costs.

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These 25 tractor parts posed quite a problem to International Harvester's new Louisville Works. Each one had to be hardened—quickly, efficiently, economically. Each one could have been a "production headache"!

Management conferred, studied and carefully investigated the problem. This analysis, coupled with their past experience, led to the final decision. The choice for these parts — Induction Heating!

Westinghouse equipment was purchased with the following results:—reduced heating, machining, and steel costs . . . lower material handling costs . . . and better quality with lower product design costs. All this with only one 50 KW-450 KC and four 20 KW-450 KC Westinghouse RF units!

If you're the kind of alert businessman who is always on the lookout for increased production at decreased costs, look into the possibilities of Westinghouse Induction Heating.

The full Induction Heating story, complete with case histories, is told in a highly interesting booklet. Just send in the coupon for your free copy!

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Department M-42
2519 Wilkens Avenue · Baltimore 3, Maryland

Send me your informative case history booklet on induction heating.

Name _____ Position _____

Company _____

Street _____

City _____ Zone _____ State _____

YOU CAN BE SURE... IF IT'S

Westinghouse

INDUCTION HEATING

Kendall B Rowell has been appointed chief engineer of the American Locomotive Co. Mr Rowell joined the company's engineering department at New York in 1940. In 1945 he was transferred to Schenectady as liaison engineer between the sales and engineering departments. He was appointed commercial engineer in 1950, and in March, 1952, was named executive engineer.

G C Danch has joined Ryan Aeronautical Co as executive assistant to the director of engineering. For the past seven years he has been serving with the Fighter Branch, Bureau of Aeronautics. **Al Deyarmond** has rejoined the organization as chief of structures, the post he held from 1946 to 1948. For the past four years he has been affiliated with the Air Materiel Command's Intelligence Section.

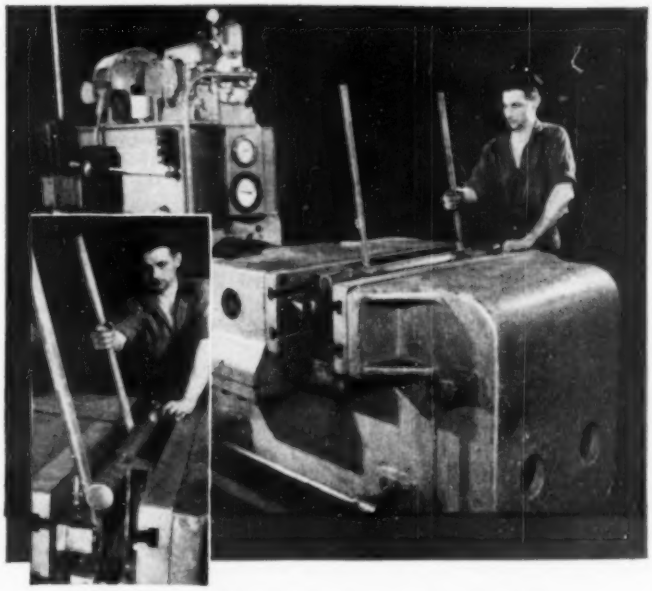
J Q A Doolittle has been appointed assistant to the manager of production, Allegheny Ludlum Steel Corp. He will make his headquarters at the company's executive offices in Pittsburgh. **Arthur H Hanks,** presently manager of the Watervliet, NY, plant's hot extrusion and stainless tubing department, succeeds Mr. Doolittle as plant manager.

James H Baldrey has been named supervisor of melting for the Cooper Alloy Foundry Co, Hillside, NJ. Mr Baldrey has been associated with the Watervliet plant of Allegheny Ludlum Steel Co for the past 18 years; since 1939 he has served in the capacity of manager of melting.

Bernard James Rainey, formerly a design engineer for John Verdiun Machine Corp, Paterson, NJ, has been named to the engineering staff of Auburn Button Works, Auburn, NY. He has been assigned to the company's vacuum forming division.

William G Cole has been appointed sales representative of Bohn Aluminum & Brass Corp, assigned to their Chicago office. Mr Cole has been associated with the company as an industrial engineer since 1950.

James D Rolando has been appointed to the sales dept of Brainard Steel Div, Sharon Steel Corp, where he will handle anti-checking irons and tie-handling systems. He was formerly with Wean Engineering Co and with B F Goodrich Co.



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Mercury Manufacturing Co., Chicago, Ill., producers of fork trucks, tractors and trailers, uses a 200-Ton Farquhar Horizontal Bulldozer press to make forgings and stampings and to form plates. In operation 8 hours a day, the press does most jobs twice as fast as the mechanical bulldozer used formerly, and better speed control produces better work.

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In the operation shown above, high carbon brazed steel is bent quickly and accurately. In other operations, the press forms heads on bolts, lega for caster forms, and bends structural T frames.

Mercury reports very small maintenance costs, and sums up the company's satisfaction with, "It's the best!"

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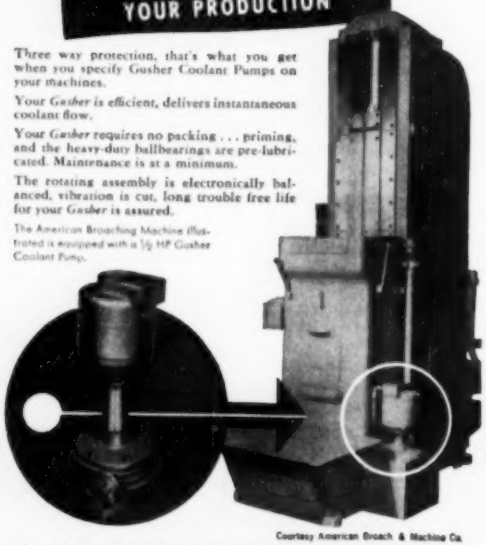
Your *Gusher* is efficient, delivers instantaneous coolant flow.

Your *Gusher* requires no packing . . . priming, and the heavy-duty ballbearings are pre-lubricated. Maintenance is at a minimum.

The rotating assembly is electronically balanced, vibration is cut, long trouble free life for your *Gusher* is assured.

The American Broaching Machine illustrated is equipped with a ½ HP Gusher Coolant Pump.



Courtesy American Broach & Machine Co.

THE RUTHMAN MACHINERY CO.

1818 READING ROAD, CINCINNATI, OHIO

Richard E Hanson, mgr of Kansas City district office, Kaiser Aluminum and Chemical Sales, Inc, has been appointed assistant to John E Menz, general sales manager in the Chicago general office. **Wallace A Davidson** was also named mgr, Kansas City field sales office, and **Donald F Sheridan** became branch representative of the Wichita Kansas, sales office.

Whiting N Shepard has been promoted to director of sales of Boston Woven Hose & Rubber Co, for which company he has been director of plastics sales. Formerly he was with Plaskon Div, Libbey-Owens-Ford Glass Co.

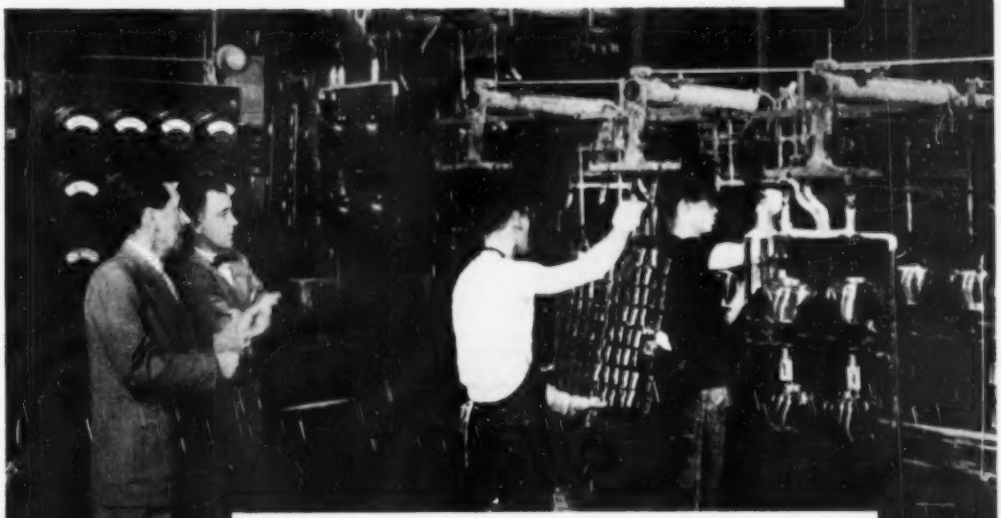
Henry K Moore has been appointed field engineer in the southern Philadelphia territory by the Bellows Co. Mr Moore was formerly associated with Prima Products, New York City.

J M Douglas has been named valve-sales mgr for Minneapolis-Honeywell Regulator Co, central region. He has served in the company's Syracuse, Albany, and New York branches. Headquarters will be in Cleveland.

R G Baker has been appointed regional sales representative, with headquarters in Chicago, for DeLaval Steam Turbine Co. **C C Bray** has been announced as manager of the Chicago district office, where he will assume charge of all sales in that area. Mr Bray replaces Mr Baker.

"What good is a 6% ceiling-price increase—we can't sell them at their present level!"

...and here is the double file loading feature of H-VW-M Full Automatic Conveyors



It's easy to see the advantages of this construction—double the capacity with the same machine. When less production is required only one rack is placed on each hanger arm—that's versatility, isn't it?

H-VW-M Full Automatic Conveyors are used daily for all types of plating—as well as anodizing, pickling, cleaning, phosphate coatings, bright dipping, painting, etching, and other finishing processes. They operate in a wide range of weight, current loads, and lifts. And they can be built with delayed set-down for varying immersion time, treatment by-pass mechanisms, air and solution agitation, racks with individual electrical control for each rack, or whatever special equipment the job requires—the ideal solution to problems of large quantity, high quality plating.

Full Automatic Conveyors are only one of many results of H-VW-M's more than eighty years of constant electroplating development. It's a continuous policy, best summed up in H-VW-M Platemanship . . . your working guarantee of the best that industry has to offer—not only in plating conveyors—but in every phase of plating and polishing.

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TORRINGTON NEEDLE BEARINGS

E E McAllister has been appointed salesman for Firth Sterling, Inc, in the Princeton, W Va, territory. Mr McAllister was formerly a foreman in Peabody Coal Corp and Old Ben Coal Corp, and was a mine inspector for US Bureau of Mines for two years.

E Eldridge Smith has been appointed sales manager of Synthane Corp, to replace **Herbert Widdop,** who became manager of the order and service department. Mr. Smith has been asst sales mgr of the company for four years.

L Camel has been promoted to divisional general sales mgr of Industrial Chemical Div, Detrex Corp, where he will direct sales and service. **D E Williard** has been named divisional general sales mgr of Industrial Equipment Div of the same company, and will control sales of degreasing machines and solvents.

Gerald M Larkins has been appointed director of slag sales for American Steel & Wire, succeeding **R Kenneth Plumb,** who was recently named manager of slag sales for U S Steel Co. Mr. Larkins was a salesman in the department he now heads.

Frank L Dempsey, Jr, has been announced as sales manager for Detroit Harvester Co's newly acquired subsidiary, Henry & Allen Corp. Sales effort will be expanded to market the output of mowers, parts, and forgings to all major agricultural-implement and garden-tractor manufacturers.

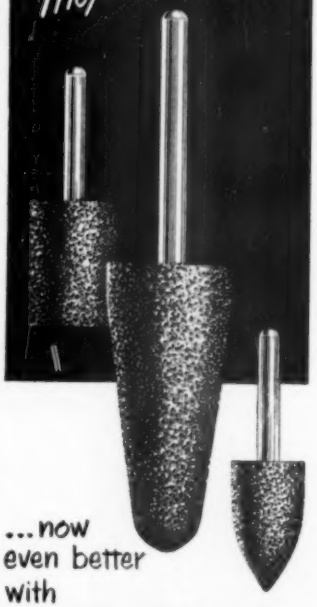
P F Marsaw has been named personnel mgr of Reed Rolled Thread Die Co. He was previously asst plant mgr of Morgan Wks, Wickwire-Spencer Steel Div, Colorado Fuel & Iron Corp.

Herman G J Grosser is now Cleveland district sales mgr for Whitfield Chemical Co, makers of metal-cleaning and finishing chemicals. He was Ohio sales representative until this appointment.

Myron C Meyer has been promoted to manager of wire-braid-hose sales, Republic Rubber Div, Lee Rubber & Tire Corp. He has had experience in the company's testing and sales departments.

Chicago MOUNTED Wheels

They're the Best



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Choose Chicago Mounted Wheels – bonded with 79E Bond – and you'll never buy any other! This tough new grinding wheel bond, exclusive with Chicago Wheel, has taken the industrial world virtually by storm, doing a better grinding, burring and finishing job faster. Greatest selection of sizes and shapes for every application. Best of all, deliveries are good . . . ready when you need them. Try 79E Bond Mounted Wheels.

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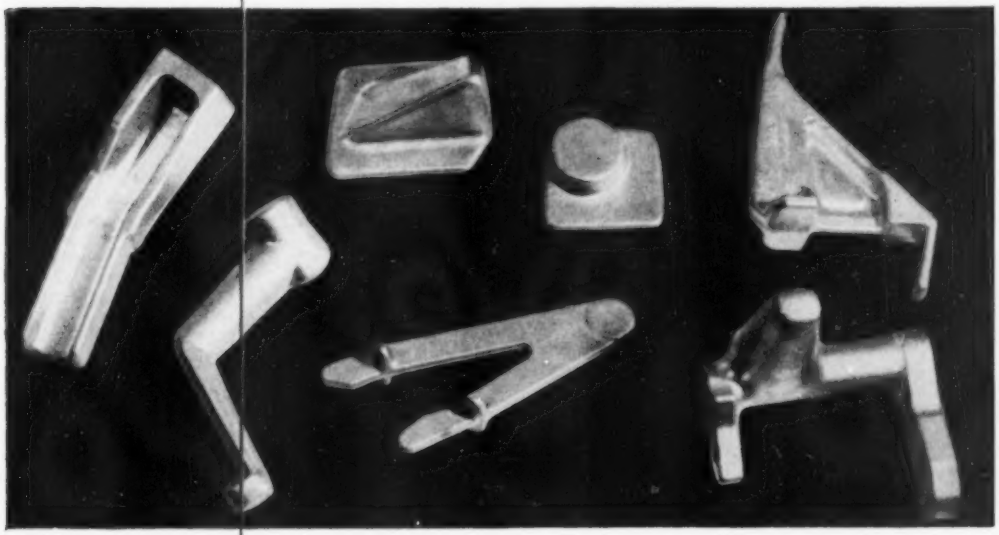
ALUMINUM FORGINGS

Plenty of Strength, Easy to Finish and what a Saving in Weight!

Where weight is a factor, particularly in moving assemblies, Mueller Brass Co. forged aluminum parts often can improve the performance of your products, because they possess approximately the same strength as steel but are only ⅓ the weight. Mueller Brass Co. aluminum forgings are ideal for high speed rotating or oscillating machines because they reduce vibration and bearing loads and thus cause less wear on other parts. They are strongest at the points of greatest stress because their grain structure, during the forging operation, can be controlled. These forgings can be produced in relatively complicated shapes to tolerances closer than sand castings. The smooth, bright surfaces eliminate costly finishing and save machining time. The Mueller Brass Co. can supply aluminum forgings to your specifications in any of the standard or special alloys.

Write us today for complete information.



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Typical forged aluminum parts produced by Mueller Brass Co. for some of the nation's leading aircraft manufacturers.

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OLIVER ACE
Universal Tool and Cutter Grinder

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***Simple* Set Up**
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Handles Wide Range of Cutter Grinding

Built to give long-lasting service, the soundly engineered Oliver Ace Universal Tool and Cutter Grinder will easily keep your most difficult cutters sharp. Equip your Toolroom NOW with an Oliver Ace . . . so efficient . . . so economical to operate.

Direct Reading for Clearance
—Reduces Fatigue
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Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing.

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DRILL POINT THINNERS
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M L Snodgrass has joined Sargeant & Wilbur, Inc, as sales manager, heavy-furnace division. He was formerly vice president of Gas Machinery Co.

Edward C Specter has been appointed asst director of industrial relations (labor relations) for American Steel & Wire Div, US Steel Co, and will succeed **Axel H Olson,** who has taken on special assignments in that department. Mr Specter has been a general foreman in the company; Mr Olson was a master mechanic at Cuyahoga Wks.

Maury E Lippert has been appointed general sales mgr of Sipi Metals Corp. He has been active in metal sales for 33 years, and has dealt particularly with brass ingots, white metal, and bearing metals.

Arthur C Hoey, Washington representative of Kennecott Wire & Cable Co, has been transferred to the Cleveland district of Chase Brass & Copper Co, where he will be sales representative specializing in Kennecott products. **Arthur F Norling** has been assigned to the Cincinnati district to represent Chase Copper & Brass Co.

Raymond Dearth has joined The Udylite Corp as sales engineer for the northern Indiana territory, transferring from Anderson Co, where he worked as an engineer on rubber and metal finishing.

Maurice H McGuire has joined the sales staff of Hydro-Aire, Inc, to handle the Detroit-Chicago area. He was formerly with the Lincoln-Mercury Div of Ford Motor Co as a buyer for jet-engine accessories.

Robert J Fraser has been announced as eastern sales supervisor for the aircraft div of The Kaynar Co. He will handle sales of self-locking nuts and fasteners. Formerly Mr Fraser was with Clary Multiplier Corp, in their aircraft-hardware div.

Emmett F Cary, formerly district sales mgr of Koppers' coupling dept, has been named district sales mgr for the metal products div of Koppers Co, operating out of Pittsburgh.

James H Sutherland has been appointed mgr of the Pittsburgh district office for S K F Industries, transferring from the position of senior steel-plant-div engineer at Philadelphia.

HERE'S THE COMPLETE "ACORN" STORY — a Body, a Die, a Cap. Put them together and you have a really positive, rugged and accurate high production threading tool. And the test plug packed with every "Acorn" Die is tangible proof that it has been **performance tested** at the factory. Cutting sizes .0 80 to 1½ .12." Holders, including a releasing model, for many types of machines.

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solid adjustable tap

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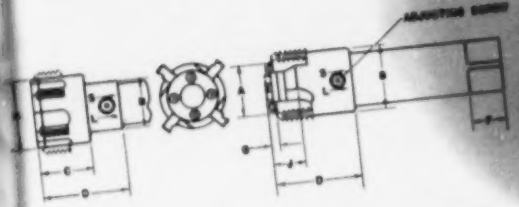
Class SJ

Where time for backing out is unimportant, where space is limited, or wherever a solid tap is desired, the Class SJ Solid Adjustable Tap is recommended. Within its size range, this simple tap will do any job that a conventional solid tap will do, and in addition can be adjusted to required decimal sizes or fits. Furthermore it may be used for more than one size pitch by the use of interchangeable chasers. Its compactness makes the SJ ideal for machines demanding a short, stubby tap, or when overhang must be avoided.



SPECIFICATIONS CLASS SJ TAPS

Style and Size Letter	CAPACITY: Straight Threads: Diam. Inches	Depth	Std. Pipe Thds.	Code Word	A	B	C	D	E ±	F ±	G ±	M ±		SHANKS: Standard: Dia.	Lgt.	Morse Taper	Also available: Max. Dia.	Lgt.	Min. Dia.	Lgt.	CHASERS
SJ-1	1 5/16–1 5/8	Limited Only by Diameter and Length of Shank	11	Easer	1 1/32	1 1/32	....	2 3/8	1/16	3/64	5/32	1/32	17/32	1	5	4	1 1/4	5	3/4	1 1/2	4
SJ-1 1/4	1 5/8–1 15/16		11	Eclat	1 7/32	1 1/16	....	2 1/2	15/64	15/64	5/32	1/32	5/8	1 1/4	5	4	1 1/4	5	3/4	1 1/2	4
SJ-1 1/2	1 15/16–2 1/4		11	Edify	1 1/16	1 1/16	....	2 1/16	1 1/16	1 1/16	5/16	1/16	5/8	1 1/2	5	4	1 1/2	5	1	2	4
SJ-2	2 1/4–2 1/16		11	Educe	1 1/16	2 1/16	....	2 1/16	1 1/2	1 1/2	3/8	1/16	1	2	5	4	2	5	1	2	4
SJ-2 1/2	2 1/16–3 1/16		8	Egypt	2 1/16	2 1/16	....	2 1/16	1 11/16	1 11/16	1/2	1/16	....	2 1/4	6 1/4	5	2 1/16	6 1/4	1 1/4	2 1/2	4
SJ-3	3 1/16–4 1/4		8	Eland	3	2 1/16	2 1/2	4 1/16	1 11/16	1 11/16	1/2	1/16	....	2 1/4	6 1/4	5	2 1/16	6 1/4	1 1/4	2 1/2	6
SJ-3 1/2	4 –5		8	Elect	3 1/2	2 1/16	2 1/2	4 1/16	1 11/16	1 11/16	1/2	1/16	....	2 1/4	6 1/4	5	2 1/16	6 1/4	1 1/4	2 1/2	6
SJ-4	4 1/16–5 1/16		8	Elfin	4	3 1/16	3 1/16	5 1/16	2 1/16	2 1/16	1/2	1/16	....	3	8 1/16	6	3	8 1/16	1 1/2	3	6
SJ-4 1/2	5 –6 1/2		8	Elian	4 1/2	3 1/16	3 1/16	5 1/16	2 1/16	2 1/16	1/4	1/16	....	3	8 1/16	6	3	8 1/16	1 1/2	3	6
SJ-5	5 1/2–7 1/2		8	Ember	5	3 1/16	3 1/16	6	2 13/16	2 13/16	5/16	1/16	....	3 1/4	8 1/16	6	3 1/16	8 1/16	1 1/2	3	6
SJ-6	6 1/2–8 1/2		8	Epoch	6	3 1/16	3 1/16	6	2 13/16	2 13/16	5/16	1/16	....	3 1/4	8 1/16	6	3 1/16	8 1/16	1 1/2	3	6

Chasers interchange in Class "S" Taps.
†Standard straight shanks are furnished unless otherwise specified. Where required, ends of shank will be tapered per dimensions "E" and "F" without extra charge.
a G = Distance from front of Chaser to front of Cap.
NOTE: Separate taps recommended for right and left hand tapping. Taps for right hand furnished unless otherwise specified.
* 1" Pipe recommended only for free cutting materials where work has been taper reamed to size.
as H = Amount projection Chasers extend beyond Cap.

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Greenfield Tap and Die Corporation
NEW HAVEN 15, CONNECTICUT

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Chase Phosphor Bronzes do an outstanding job where metal must stand up under rugged use.

They resist wear and have high fatigue strength. They are extremely ductile and resilient. And, of course, they have excellent resistance to corrosion.

Characteristics like these make Chase Phosphor Bronzes suited for a wide variety of uses—from bearings and diaphragms to heavy duty springs and valve parts.

Chase metallurgists and engineers check carefully on surface finish and internal characteristics to make sure that every lot of Chase Phosphor Bronze Rod, Strip or Wire is up to the usual high Chase standards. Send coupon for further information.

FREE Folder gives tables of Chase Phosphor Bronze properties (hardness, tensile, fabrication, physical) as well as uses and forms.

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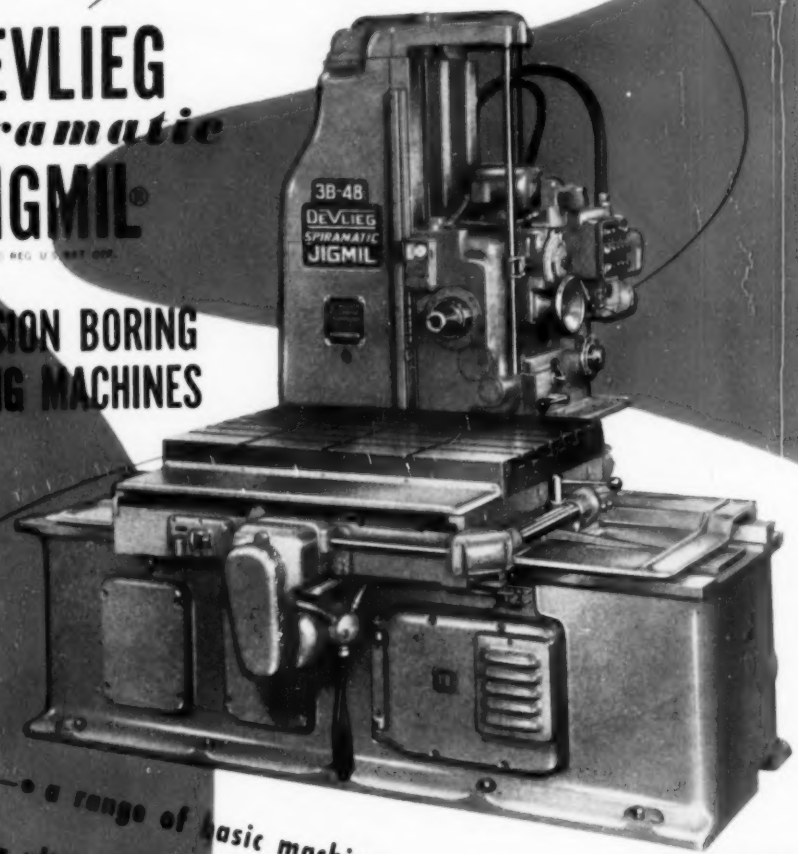

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GIVE YOU ALL THESE OUTSTANDING FEATURES

1—super finish reduces wear to a minimum

2—blended radius reduces tool hang up

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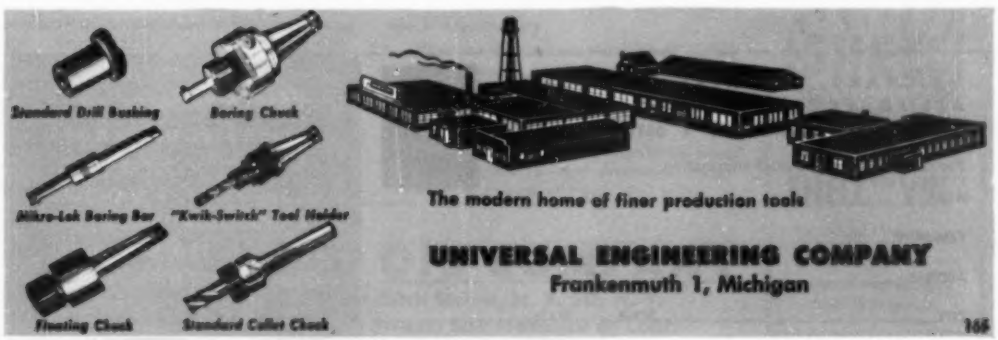
4—knurled head provides quick sure grip

3—100% concentricity and hardness tests assure accuracy



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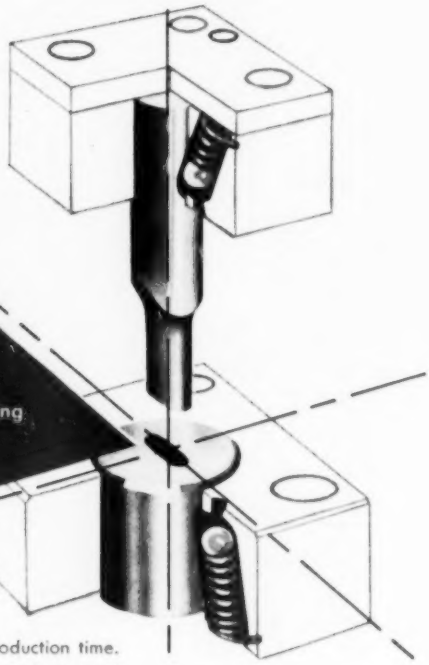
with Standardized

R-B PUNCHES AND DIE BUTTONS

The R-B ball lock prevents radial or vertical movement in the retainer once the punch or die button is locked in place. Just a push, a twist and "click" the ball locks in the recessed portion of the R-B standardized punch or die button—no additional keying required. Special shapes and the largest sizes of standardized R-B punches and die buttons are kept perfectly aligned, by the spring loaded ball lock. You can be sure of trouble-free piercing when using standardized R-B punches and die buttons.



Tool standardization is the basis for saving production time. With R-B you get the accepted standard of the sheet metal industry—in standard design features that save in engineering, die construction and operation.

RICHARD BROTHERS DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 67 • 12605 BURT ROAD • DETROIT 23, MICH.

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COMPANY _____

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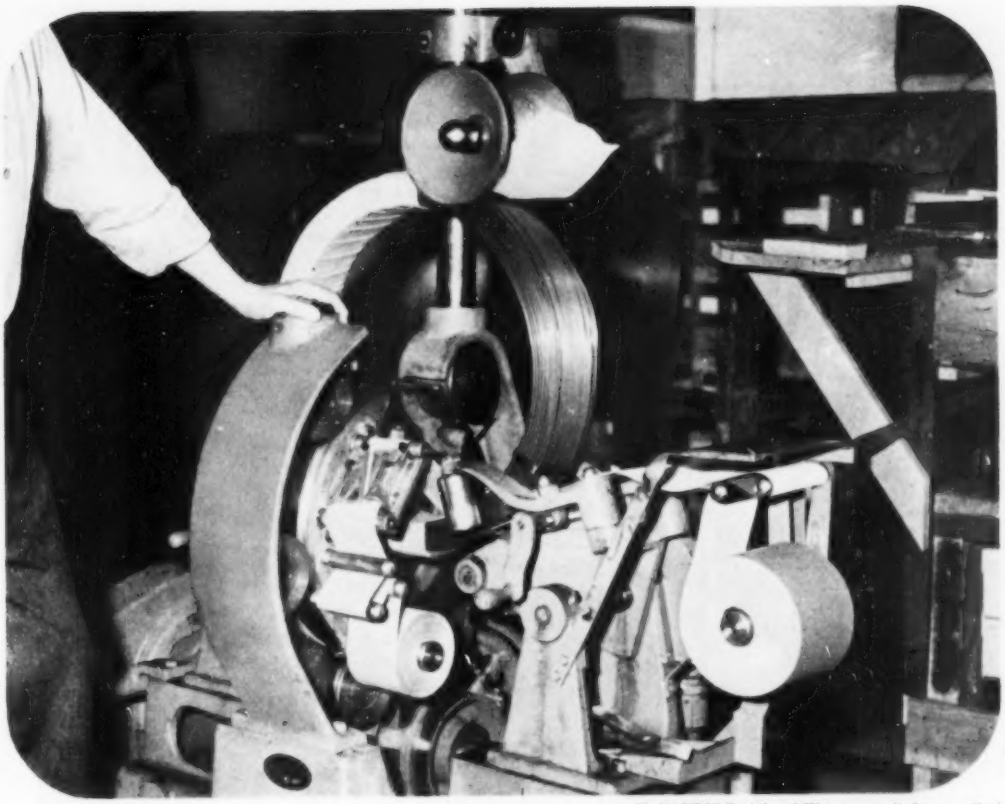
Also Produced in
ALLIED'S FOUR PLANTS
HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • SHEET METAL DIES • ALLITE DIES CAST OF ZINC ALLOY • JIGS • FIXTURES



Shell "VPI" Peripheral Wrap as applied to a coil of hard-facing alloys . . . saves expense of removing rust-preventive material . . . reduces packing costs.

New packing technique HALTS RUST DAMAGE

. . . cuts packing costs as much as 60%

THE GOOD WORD AMONG steel packagers and shippers today is that rust can now be prevented by Shell VPI® (a volatile corrosion inhibitor). Composed of solid amine nitrites, Shell "VPI" vaporizes and when moisture is present in the air . . . renders this moisture non-corrosive. Containers need not be airtight, however, for excellent corrosion protection.

In terms of packing costs, this new technique is so much simpler and faster that costs have been cut as much as 60%.

This can be traced directly to the fact that Shell "VPI" may be applied quickly and easily in either crystalline form or as a coating on wrapping paper. Hence rust-preventive measures are greatly simplified and container costs are reduced. And, of course, rust removal before the product's use is unnecessary.

Other major advantages of Shell "VPI" are: Low cost . . . Long periods of volatility . . . Non-toxic . . . Elimination of greasing and degreasing . . . Harmless to plastics or ferrous metals.

Consult your Shell Representative about this new method of rust prevention today. Or write to nearest address listed below.

SHELL OIL COMPANY

50 West 50th Street, N. Y. 20, N. Y.
100 Bush Street, San Francisco 6, Calif.

SHELL

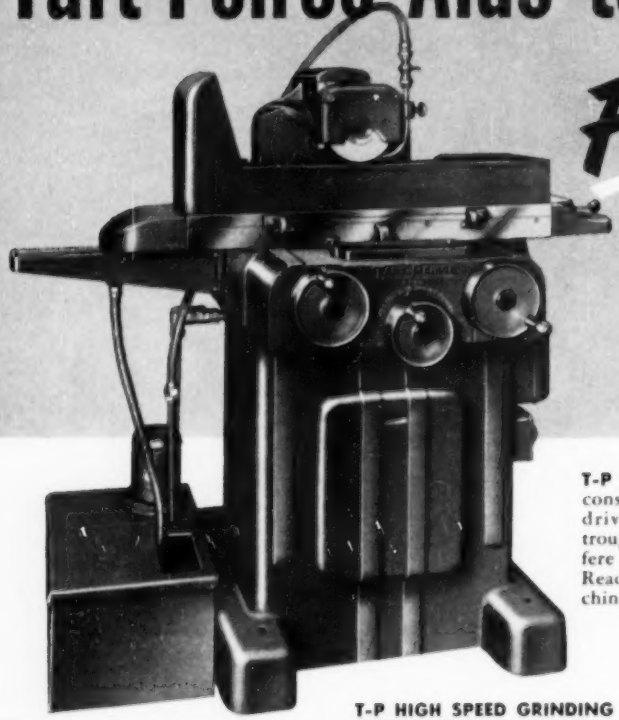
SHELL "VPI"

(a volatile corrosion inhibitor)

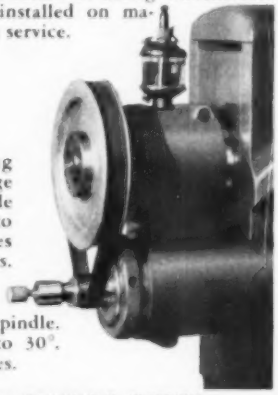
stops air and moisture from making rust.

Taft-Peirce Aids to Grinding

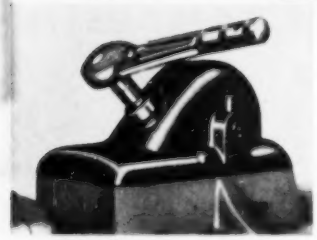
Faster Better Easier



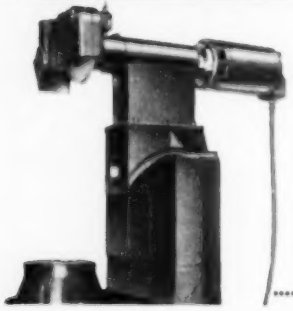
T-P WET GRINDING ATTACHMENT consists of coolant supply tank, motor driven pump, splash guards, drain trough, and wheel guard. Won't interfere with action of tilting wheelheads. Readily installed on machines in service.



T-P HIGH SPEED GRINDING ATTACHMENT permits grinding small angles or slots with large wheel machine. Ball bearing spindle operates at 18,000 rpm. Clamps to main spindle quill. Accommodates wheels with $\frac{1}{8}$", $\frac{3}{16}$", and $\frac{1}{4}$" shanks.

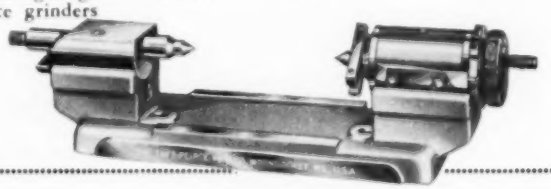


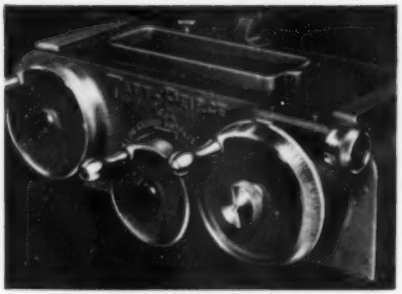
T-P SPINDLE TILTING ATTACHMENT speeds accurate angular adjustments of spindle. Turns spindle block to any angle up to 30°. Readily installed on new or old machines.



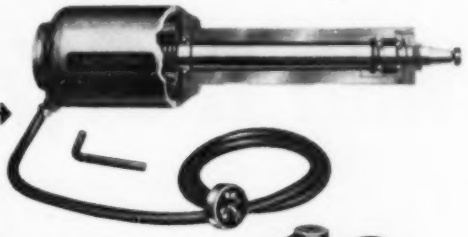
T-P RISER BLOCK for grinding work more than 12" high. Replaces column cap, provides bore for spindle quill. Increases grinding range of Taft-Peirce grinders to 24" in height.

T-P INDEX GRINDING FIXTURE divides work accurately for grinding flats, keyways, splines, and other spacing setups. Available with 12-tooth precision index plate, or special plates up to 24 teeth.

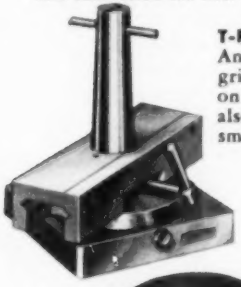




T-P VERNIER FINE-FEED ATTACHMENTS make precision settings faster, easier. Read to .0001". Installed on either horizontal or vertical feeds on new or old model T-P Surface Grinders.

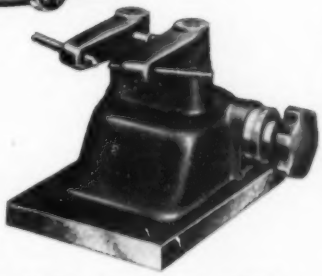


T-P GRINDING SPINDLES give finer finishes and greater precision. Unique ball bearing construction minimizes end-thrust and radial-play . . . increase wheel-life and loading capacity. ¾ hp., 3600 rpm. motor is sealed and lubricated for life.



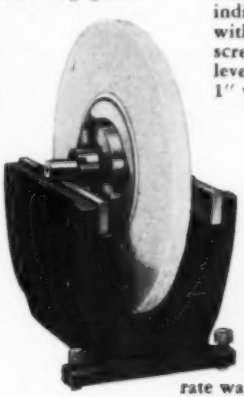
T-P ANGLE AND RADIUS WHEEL DRESSERS Angle Wheel Dresser shown simplifies form-grinding of angles. Base is graduated 90° on either side of center. Radius Wheel Dresser, also available, for grinding contours with small surface grinders.

T-P NARROW WHEEL DRESSER dresses to thinnest possible proportions safely and accurately. Graduated dial mounting permits precise adjustment of two diamond points. Useful for grinding narrow slots in form tools, gages, etc.



T-P WHEEL BALANCING STAND indicates balance of mounted wheels with great accuracy. Three leveling screws permit precise adjustment of leveling surfaces. For wheels up to 1" wide, 8" diameter.

T-P SINE SETTING SLEEVE is 2½" cylindrical sine bar. Fits over tapered end of wheel spindle in place of grinding wheel. Speeds accurate setting of tilting spindle.



T-P WHEEL BALANCING THIMBLE provides a quick, accurate way to balance grinding wheels up to 8" diameter, 1" face, and 1¼" hole. Simply adjust two balancing collars. Available from stock.

For the complete story on these items and many more, get your copy of the New Taft-Peirce Handbook, just off the press.

T-P means Top Precision

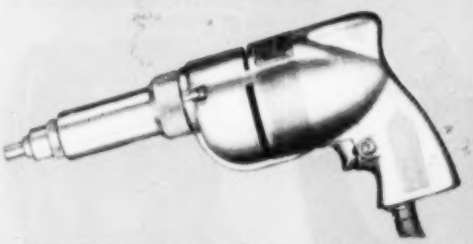
THE TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

"We save $3,000 a year with 2 SKIL drivers"...

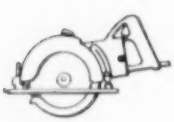
says **Ernest Koller,** general manager
CHENEY WEEDER COMPANY
Cheney, Washington

"SKIL Drivers have boosted production, reduced labor costs amazingly," says Mr. Koller. "We make tillage and harvesting equipment. In the final assembly of each of our 'Grain Saver' combinereels, we drive an average of 680 nuts. Formerly, it took three hours to do this by hand. Now we do it in one-third the time with SKIL Drivers and reduce production costs $3,000 a year."

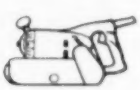
William Clute, production superintendent, drives nuts on a spoke base of a "Grain Saver" Reel with a Model 489 SKIL Driver. He says, "We use these fine tools to drive more than 300,000 nuts a year on these reel assemblies alone. SKIL Drivers deliver finest performance with lowest maintenance. We couldn't do without tools of this calibre!"



SKIL Driver—Model 303—(Model 489, with reversing switch). Adjustable clutch. Trigger Switch. Capacity: ¼" machine screws and nuts; No. 12 wood screws and self-tapping screws. Standard speed, no-load: 750 r.p.m. (1000 r.p.m. and 1250 r.p.m. optional.) One of 20 models to choose from.

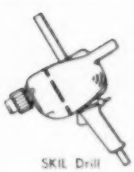


SKIL Saw •



SKIL Belt Sander •

SKIL Disc Sander •



SKIL Drill

Call Your SKIL Distributor for Complete Information

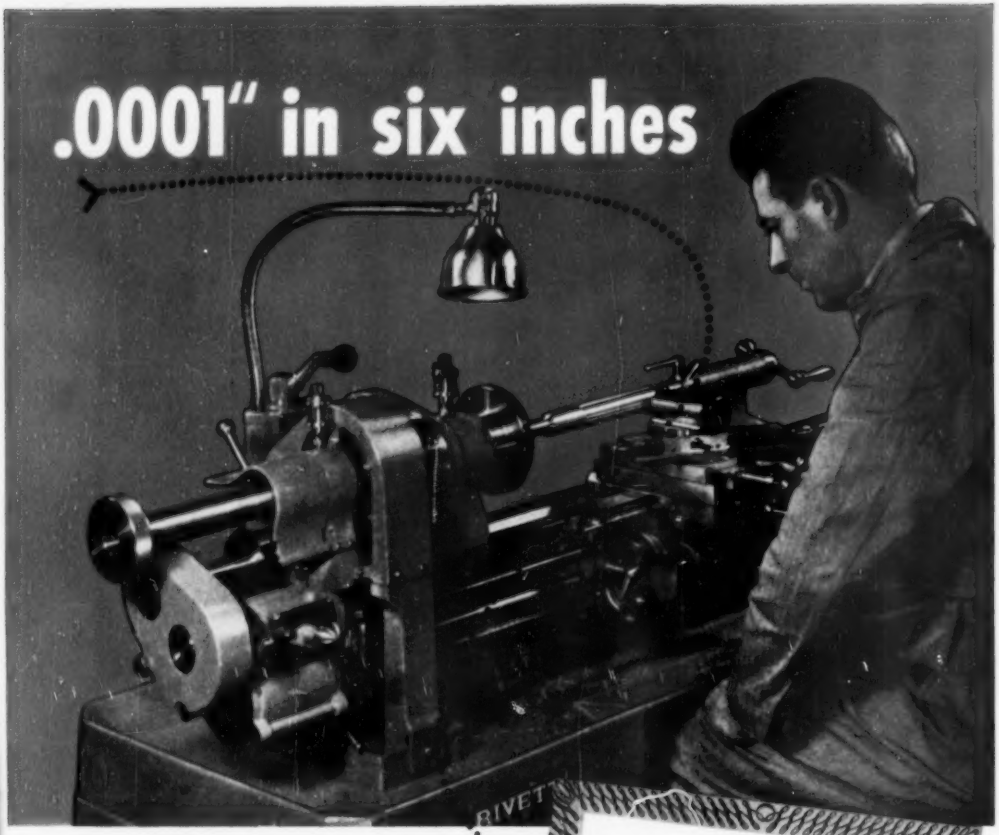
Lee Roy Jackson uses the Model 489 SKIL Driver to drive nuts on eye-bolts in another stage of the assembly. He says, "SKIL Drivers do the job faster, easier and with far better results. They drive each nut tight, and I never get tired using them—even after a full day of driving nuts."

SKIL

PORTABLE TOOLS

SKIL Products are made only by SKIL Corporation
formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois

SKIL Factory Branches in 34 Principal Cities
In Canada: Skiltools, Ltd., 3601 Dundas Street West, Toronto 9, Ontario



PLUS every known attachment!

A symbol of extreme accuracy for years, this Rivett 608 lathe is used in nearly every instrument and tool shop where fine exacting work is performed. A greater number of modern mechanical marvels have been developed on this small lathe than on all other machine tools combined.

But the 608 is not just a single-purpose tool — it is a small but exceedingly powerful back-geared, screw cutting engine lathe. It has slide areas equal to those of other lathes twice its size — its bronze-bearing spindle guarantees finish and perfect roundness for all work turned. Finely-made attachments for milling, spiral-cutting, slotting, relieving, taper turning, radius turning, grinding, and forming enable the user to complete his entire series of operations utilizing the inherent precision of the lathe itself.

GUARANTEE

The Rivett 608 will turn or bore within 0.0001" in six inches work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within a limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

You'll be adding your name to a prominent list of users by installing a 608 Rivett. For a more detailed story, write for Bulletin 608F.

RIVETT LATHE & GRINDER, Inc.

Dept. AMR12, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Sooner Craftsman's Master Tools

Pull...like a bull elephant

OK DUAL ADJUSTMENT milling cutters, size for size, are the huskiest produced. In simplicity lies their great strength. There are just two parts — body and blades . . . uncomplicated or weakened by cut-outs or recesses for locks, pins, gibs or gadgets. Bodies are drop-forged, with slots positioned to micrometer dimensions. Blades are available in high speed, alloys or carbide.

The drive-fit insures a secure seat. Mating serrations prevent blade movement except for advancement to compensate for wear. This simple construction permits the use of more blades in the fine pitch series and heavier blades in the coarse pitch series. OK cutters convert the full horsepower available without losing a kick, remove the maximum amount of metal — measured in speed, feed, chips, minutes, power consumption or man hours. **Do you have a copy of the OK catalog 13?**

OK

modern milling cutters for modern milling machines

THE OK TOOL COMPANY, Milford, New Hampshire

U·S·S Carilloy steel springs soak up

Alloy springs cushion tremendous mechanical shocks in 200-ton short-circuit generators ...save expense of forgings

In testing high-voltage circuit breakers, engineers at General Electric Company *intentionally* short-circuit two huge motor-driven generators. Each of these test generators is normally rated 125,000 kva, but provides short-circuit currents as high as 182,000 amp, instantaneous, offset wave, corresponding to about 1,625,000-kva rms symmetrical short-circuit duty. Such operation causes tremendous mechanical stresses to build up inside each machine. These stresses create a torque that tries to twist loose the 200-ton stator assembly. But no damage is done! These powerful machines are mounted on U·S·S CARILLOY steel plate springs that cushion the shock and then damp out any vibrations that follow.

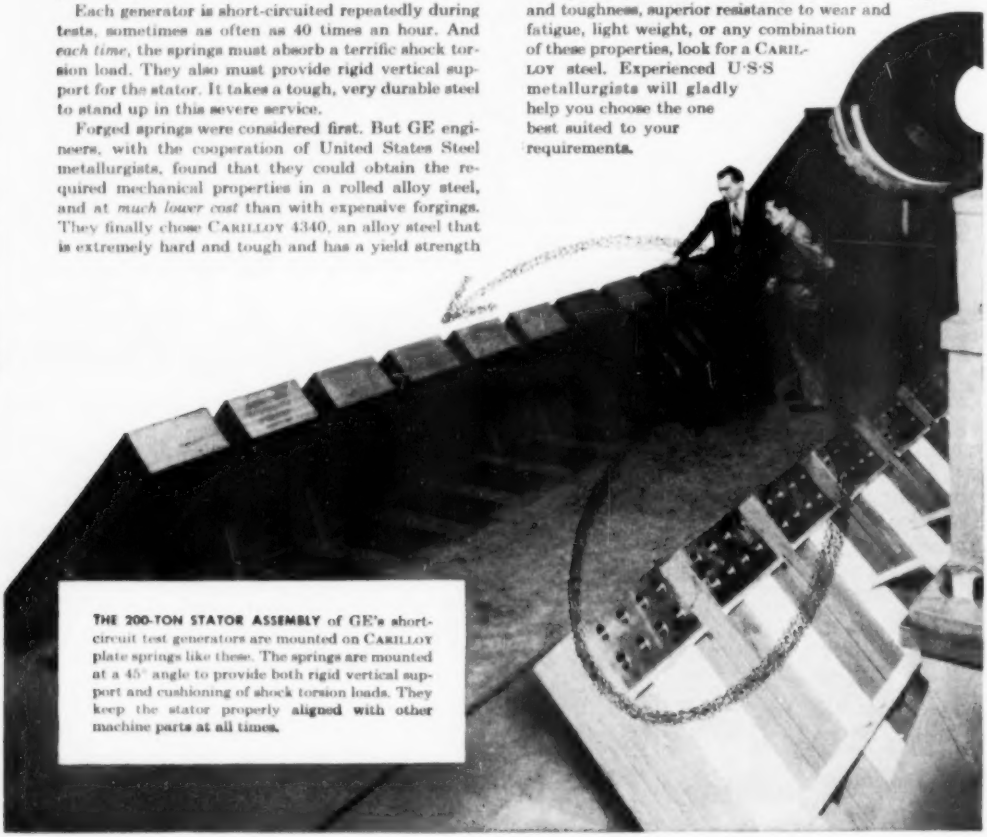
Each generator is short-circuited repeatedly during tests, sometimes as often as 40 times an hour. And *each time*, the springs must absorb a terrific shock torsion load. They also must provide rigid vertical support for the stator. It takes a tough, very durable steel to stand up in this severe service.

Forged springs were considered first. But GE engineers, with the cooperation of United States Steel metallurgists, found that they could obtain the required mechanical properties in a rolled alloy steel, and at *much lower cost* than with expensive forgings. They finally chose CARILLOY 4340, an alloy steel that is extremely hard and tough and has a yield strength of about 100,000 psi. This insures good endurance at 40,000 psi as required in this rugged application.

Also important was the fact that CARILLOY 4340 is easy to heat treat. Plates were furnished to GE quenched, tempered, and special cut and stress relieved.

This steel is giving excellent service. Initial vertical displacement of each generator was only 0.35 mils. Under the most severe short circuit, developing a whopping *8 million lb. ft.* of torque, frame rotation is about ½ in. each way at the point of attachment of the springs. The axial centerline of the machine stays within 30 mils of its normal position. These movements are sufficient to cushion the shock effectively.

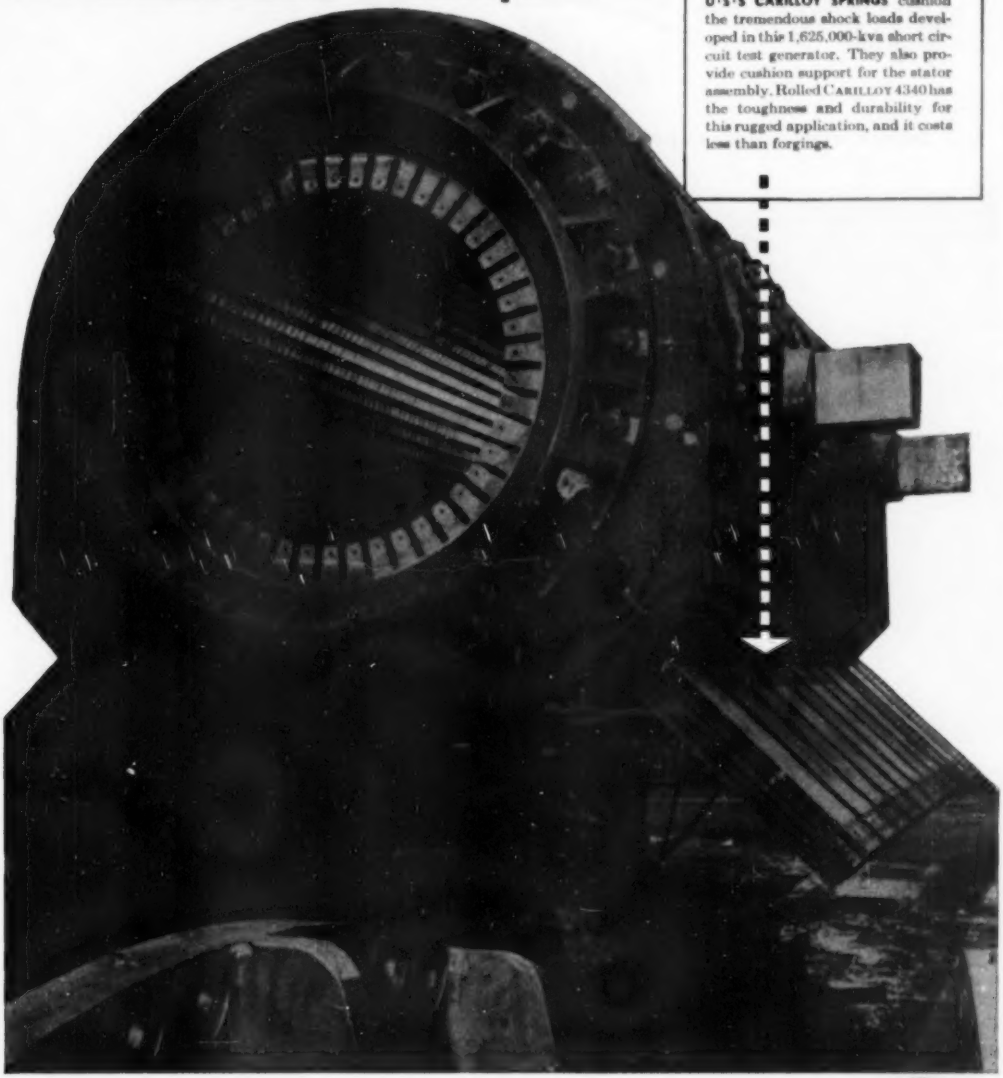
Any time you need a steel to provide high strength and toughness, superior resistance to wear and fatigue, light weight, or any combination of these properties, look for a CARILLOY steel. Experienced U·S·S metallurgists will gladly help you choose the one best suited to your requirements.



THE 200-TON STATOR ASSEMBLY of GE's short-circuit test generators are mounted on CARILLOY plate springs like these. The springs are mounted at a 45° angle to provide both rigid vertical support and cushioning of shock torsion loads. They keep the stator properly aligned with other machine parts at all times.

8 million lb.-ft. torque!

U·S·S CARILLOY SPRINGS cushion the tremendous shock loads developed in this 1,625,000-kva short circuit test generator. They also provide cushion support for the stator assembly. Rolled CARILLOY 4340 has the toughness and durability for this rugged application, and it costs less than forgings.



U·S·S Carilloy Steels

USS

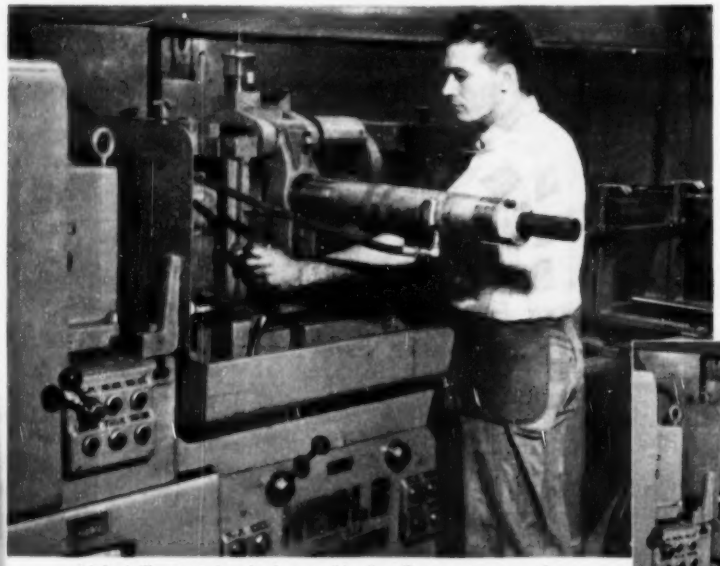
UNITED STATES STEEL COMPANY, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

D-7949

UNITED STATES STEEL

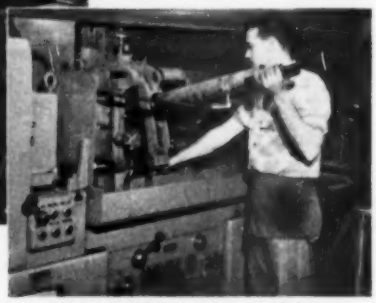
Handles two jobs with one setup...

bores and counterbores camshaft housings in a single operation



Airfeedrill mounted on boring machine handles an extra operation without changing the setup.

Clever Fellows . . . these hole engineers! Their ingenuity seems to know no bounds. We scarcely suspected that Airfeedrills could be used so many ways—for so many different purposes—until hole engineers began figuring what they could do with them. Here is another instance.



The Airfeedrill swings up out of the way while the machine is loaded.

To counterbore a pad on camshaft housings by conventional methods would have required a farm equipment manufacturer to invest $2,500 in an extra machine plus $1,200 for a fixture—total $3,700. The machine would have needed 28 sq ft of valuable floor space.

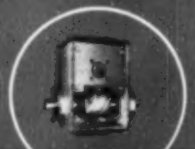
Instead, a clever hole engineer rigged a device so that a Keller Airfeedrill could be mounted directly on the boring machine. Thus the counterboring is handled as an extra operation during the regular boring cycle.

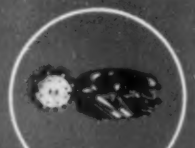
This arrangement saved most of the $3,700 investment as well as 28 sq ft of floor area. Even more important, it saves extra handling and setup time for every camshaft that is bored, making a substantial saving in machining costs.

Perhaps you have a spot where Keller Airfeedrills can provide an additional operation, or help bring obsolescent machines up to date. Discuss it with a Keller application engineer.

KELLER *Pneumatic Tools*

KELLER TOOL COMPANY
GRAND HAVEN, MICH.





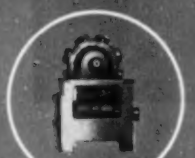
Designers and users of machinery employing . . .

INTERMITTENT MOTION

replace GENEVA DRIVES with PRECISE, VERSATILE AND DURABLE

ferguson ROLLER GEAR DRIVES

FOR HIGH SPEED OPERATION!



ferguson ROLLER DRIVES REQUIRE NO MAINTENANCE FOR AT LEAST 8000 HOURS OF OPERATION AND CAN BE RENEWED AT ANY TIME MERELY BY REPLACEMENT OF STANDARD BALL BEARINGS.

FERGUSON DRIVES REPLACE:

GENEVA DRIVES (any type)

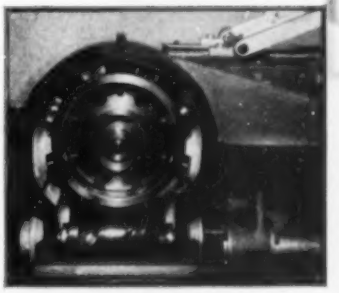
RATCHET AND CRANK MECHANISMS

AIR OPERATED INDEXING MECHANISMS

CAM OPERATED INDEXING MECHANISMS

Other intermittent motions—either lineal or angular

Ferguson Roller Gear Drives are custom-engineered to meet your exact requirements. Our engineers are always able to help you solve any problems concerning intermittent motion or indexing mechanisms on automatic machines.



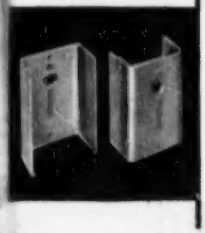
Roller Gear Drive for automatic machine with 8 rollers and 8 stops per revolution of the gear. Indexing period is 180° deg of cam rotation; cam speed, 240 R. P. M.

ROLLER GEAR DIVISION

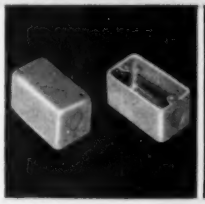
FERGUSON MACHINE & TOOL CO.

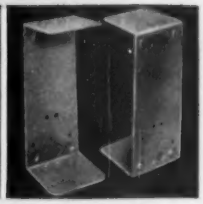
471 Paul Ave., Ferguson Sta. • St. Louis 21, Mo.

BOOTH 1315
FOURTH PLANT MAINTENANCE SHOW
Cleveland, Ohio
JAN. 19-22



ACCURATE





Perhaps you don't think of accuracy as an important factor in the production of stampings like those illustrated here— but maybe you should. Accuracy in press operation is more than a matter of holding tolerances in the work. Inaccurate operation means unnecessary wear on dies, and that costs money.

The fact that Clearing presses were chosen by this manufacturer of electrical equipment is significant because it demonstrates a real understanding of the elements of cost. If you consider all the factors, you will choose Clearings, too.

CLEARING MACHINE CORPORATION

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HAMILTON DIVISION, HAMILTON, OHIO

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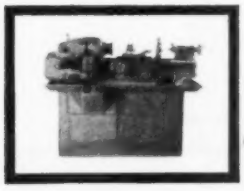
THE WAY TO EFFICIENT MASS PRODUCTION

...another product from the plant of precision!

9" x 24" Tool and Gage-Makers' Lathe with Electronic Motor Control

Now you can have the advantages of quiet, simple, modern Hendey Electronic Motor Control on the Hendey 9" x 24" Tool and Gage-Makers' Lathe. These advantages include stepless spindle speeds from 25 to 3000 R.P.M. by potentiometer control of both field and armature of the 3 H.P. d-c. motor. Exceptionally close speed control is obtained even under changing load. I.R. compensation gives full torque at low speeds over the complete armature control range. A full stop from maximum speed is accomplished in approximately 1½ seconds. Starting, stopping or reversing, even at 3000 R.P.M., is accomplished smoothly and rapidly. This new drive is optional equipment, and full information is available in our new 9" x 24" Lathe catalog. Write for your free copy! It gives full details on the new drive as well as other features of the Hendey 9" x 24" Lathe, which guarantee precision output with minimum effort.



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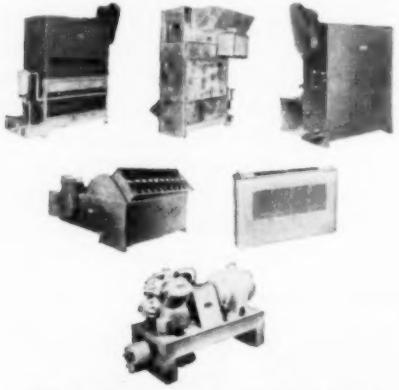
Ever see a better balanced family?

Careful balance is the secret behind any successful refrigeration or air conditioning installation. When compressors, evaporative condensers and air conditioning units are precisely balanced in size, quality and performance to work together with single-unit efficiency, you get superior performance and many *extra* years of equipment life.

Only the Carrier line of products can give you this kind of balance. It's the largest family of products in the business, with a unit (or a combination of units) to meet every industrial need, regardless of size or type of application.

Your local Carrier dealer is listed in the Classified Telephone Directory. Get in touch with him. He's a factory-trained expert, ready to analyze your needs at any time. Carrier Corporation, Syracuse, New York.



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AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING
FOR 50 YEARS—THE PEOPLE WHO KNOW AIR CONDITIONING BEST

R-266

Firth Sterling's HWD steels, because of their versatility in forging dies, extrusion dies, and casting dies, are fast becoming the popular choice throughout the industry. Here are six very important reasons why:

(1) Longer die life is assured because HWD steels maintain their *hardness.*

(2) Cracking is greatly minimized because of HWD's exceptional *toughness.*

(3) HWD steels have real resistance to *"washing"* in die casting operations.

(4) A thorough series of *inspections,* including ultrasonic testing, insures the very best in top *quality* steel.

(5) Air hardening insures *minimum movement* in heat treatment.

(6) Balanced alloy composition provides exceptional resistance to *checking or cracking* when the steel is cooled by water.

HWD Comes in Three Grades

HWD #1 and #2 are essentially the same steel except that HWD #2 has no tungsten, giving it more resistance to thermal shock. HWD #3 is Firth Sterling's latest modification of HWD #2 and has a higher Vanadium content to increase the life of die casting dies.

Firth Sterling INC

OFFICES* AND WAREHOUSES: HARTFORD NEW YORK* DETROIT CLEVELAND DAYTON* PITTSBURGH* CHICAGO BIRMINGHAM* LOS ANGELES PHILADELPHIA*

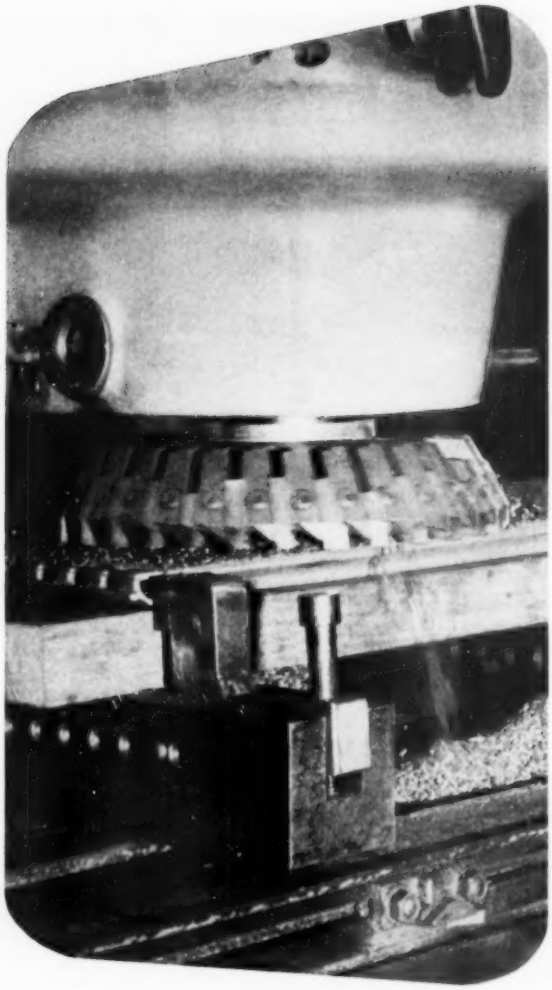
GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

A WEEK'S FINISHING DONE IN A DAY

HAYNES STELLITE alloy milling cutter blades recently solved a tough finishing problem in the production of cast iron mold jackets. Face-milling operations with harder tool materials failed because of chipping and spalling of the cutter blades after finishing only a few castings. Then the foundry tried grinding the jackets. But this was too slow; it took at least 30 minutes to grind each one.

A switch to HAYNES STELLITE Star J-Metal blades cut finishing time to a mere six minutes per casting. An extra saving results from the long life of the HAYNES STELLITE alloy blades. They produce about 350 pieces per grind.

HAYNES STELLITE alloy tools are ideal for cast iron milling jobs because of their high compressive strength at cutting temperatures, good impact strength, and extremely low coefficient of friction. Contact our nearest District Office for on-the-job help with your machining problems, or write for the new manual, "HAYNES STELLITE Metal-Cutting Tools."



This 12-in. diameter cutter, containing 32 HAYNES STELLITE alloy inserted blades, removes 1/16-in. of stock from cast iron mold jackets. A 36-in. casting is milled with this setup in about 1/5 the time required for grinding.

HAYNES alloys
TRADE-MARK

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
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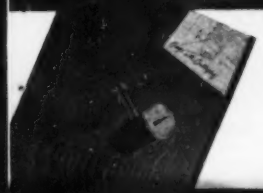

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Cuts Boring Time on Columns 75% with BUNELL TOOLING

● The Greaves Machine Tool Company of Cincinnati, Ohio, a leading manufacturer of Milling Machines, has reduced the time required for boring their machine columns by 75% with Bunell Tooling.

● Greaves is also consistently obtaining a greater degree of precision and accuracy by the use of Bunell Boring Fixtures and Boring Bars (illustrated above). Time and labor savings like this speed production and help Greaves reduce costs and meet shorter delivery requirements of customers.

● Bunell's complete modern plant facilities and experienced engineering staff are available to help you with your tooling problems. Write for full information.

WRITE FOR FREE CATALOG which describes Bunell services, facilities and equipment.

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THE AMAZING NEW COOLANT

WHICH IS REVOLUTIONIZING SHOP PRACTICES IN THE METAL-WORKING INDUSTRY!

POWDER'D OILS, designed in individual formulas for grinding and cutting, are the end products of extensive research developed to create the most perfect coolants for ALL metal-working operations. They have made all other coolants OBSOLETE! We ask you to carefully consider these claims backed by the enthusiastic reports of thousands of satisfied users in metal-working plants of all sizes, by the integrity of the maker and the performance of the product. We guarantee that there is NO comparable product on the market!

One drum of POWDER'D OIL does the work of FOUR drums of soluble oils and THIRTY-THREE drums of straight cutting oils, and DOES IT BETTER! Packed in fiber drums, its extreme concentration reduces costly storage problems, and eliminates returns of steel drums, cash deposits and paper work. POWDERED'D OIL, mixed in the proper proportions with water, makes a CLEAR, green solution that is easy on the eyes, makes the work visible at all times and is free of odor, rancidity and gumminess. It is absolutely harmless to men and machines. The solution will not separate and solution life is increased many times over old-style products. Ease of handling and of mixing eliminate waste and safety hazards from slippery floors. Foaming problems, too, have been eliminated and POWDER'D OILS, cooling and wetting-out properties give excellent wheel and tool life and better finishes.

AND . . . POWDER'D OILS are self-cleaning—no solvents such as kerosene, etc., are required as is the case when removing deposits left by other coolants. These cleaner, more stable, longer-lasting solutions greatly reduce down-time. POWDER'D OILS offer you maximum efficiency, plus amazing savings in original and resultant costs. . . . For better operating conditions, savings in time — space — money — plus maximum efficiency . . . POWDER'D OILS.

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Panel of bare 24ST Aluminum, untreated. Extensive corrosion after 168 hours in salt spray.

Panel of bare 24ST Aluminum, treated with Bonderite 710. No corrosion after 168 hours in salt spray.

Panel of bare 24ST Aluminum, treated with Bonderite 710. In excellent condition after 1008 hours in salt spray.

SALT SPRAY TESTS SHOW CORROSION RESISTANCE

ALUMINUM gets increased corrosion resistance, greater durability for paint, with BONDERITE* 710

Here's the surface treatment that practically ends the problem of corrosion on aluminum. Even on high-strength alloys, most susceptible to corrosion, Bonderite 710 protects bare metal for amazingly long periods without failure. Its performance as a base for paint is outstanding.

Bonderite 710 produces an amorphous chromate coating on aluminum surfaces. It can be applied by spray, immersion, or brush, on sheets, castings, forgings and extruded and rolled forms. It operates at low temperatures and is sludge-free.

Bonderite 710 is a liquid—safer and easier to handle, easier to use, more positive in results.

This product's performance equals (*exceeds*, in most important requirements) the government specifications for chemical treatment of aluminum and its alloys.

For bare corrosion resistance, or as a corrosion-resistant base for paint, investigate Bonderite 710 for aluminum.

SEND FOR FREE TECHNICAL BULLETIN—Write today for FREE illustrated bulletin on "Bonderite 710 for Aluminum".

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BONDERITE—corrosion resistant paint base
BONDERITE and BONDERLUBE—aids in cold forming of metals
PARCO COMPOUND—rust resistant
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Any way you look at it...

SQUARE D's balanced design means a better Motor Starter

Designed to provide the highest degree of accessibility, flexibility, and compactness —with no sacrifice of performance and long life.

EASY WIRING...
Plenty of wiring space and easy-to-get-at solderless terminals. Installation is a breeze.

ACCESSIBILITY...
Coils, contacts or overload relays can be changed without disturbing external connections. A screwdriver is the only tool you need.

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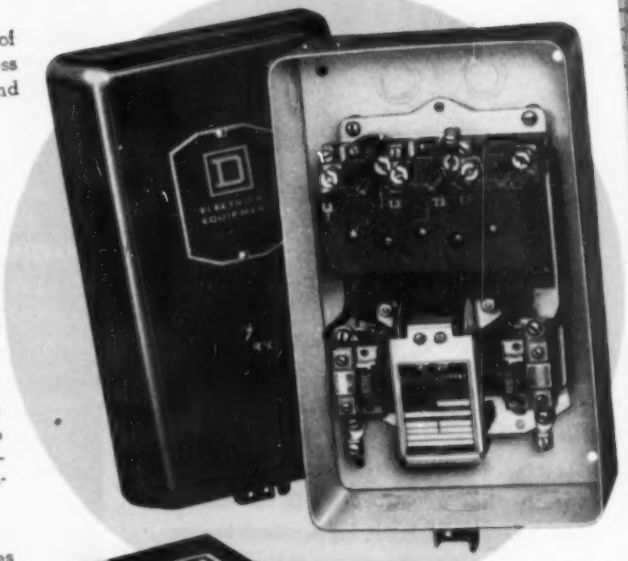
Three extra electrical interlocks may be added to size 1 starters; four to sizes 2 and 3. Contacts may be normally open, normally closed, or double circuit.

PERFORMANCE...
Straight line, guided motion minimizes wear. Large silver alloy contacts insure exceptionally long life and trouble-free performance.



"Off-the-Shelf" Parts Kits make normal maintenance easier than ever. Each kit contains parts necessary to replace all load contacts and finger springs. Electrical interlocks also available in kit form.

Write for Bulletin 8536
Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

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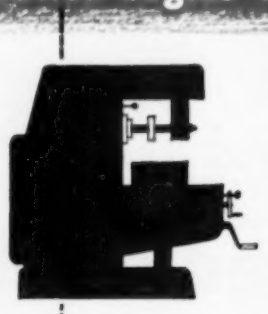
SQUARE D COMPANY

production begins with



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Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 46 years.

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SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

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Mississippi Pilots Use Marking Devices

Samuel Clemens adopted his pen name from the expression used by Mississippi River Pilots, such as he, indicating the 2 Fathom Marking Device affixed to their lead lines.

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are Designed for
ALL MARKING PURPOSES

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.

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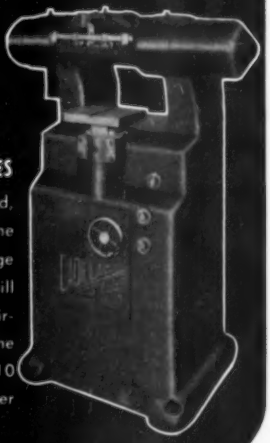
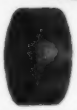
Compact, self-contained, manifold mounted. One control gives full range of marking depth. It will mark round, flat and irregular surfaces. Machine capacity is up to 110 one inch impressions per minute.





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PUNCH PRESS DIE
Faithfully reproduces and is particularly adapted to large production marking.

ROLL TYPE HOLDER
Depending on requirements, can be had for either solid or interchangeable type.

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These Sure Grip Screw Holding Screw Drivers, made by The Bridgeport Hardware Mfg. Corp., illustrate an obvious and a very simple application of retaining rings.

But there are thousands of other places where they will save,—from such simple applications as tools, toys, small parts and small gadgets to complicated heavy duty engines, large drill presses, etc.

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These inexpensive, yet very efficient, artificial shoulders are widely used, and these uses are increasing daily.

It's wasteful to cut down shafts to make shoulders. Redesign to groove smaller shafts and housings and use these high grade steel rings

Let our engineers consult with you. Send for folders.

Don't pass up this opportunity to increase profits.

THE NATIONAL LOCK WASHER CO.

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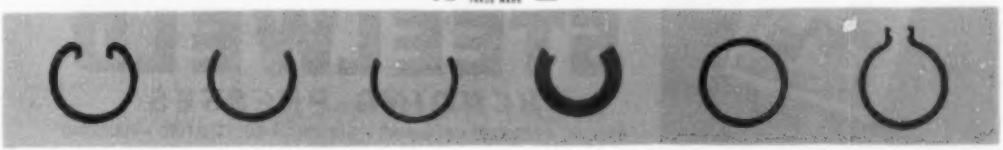

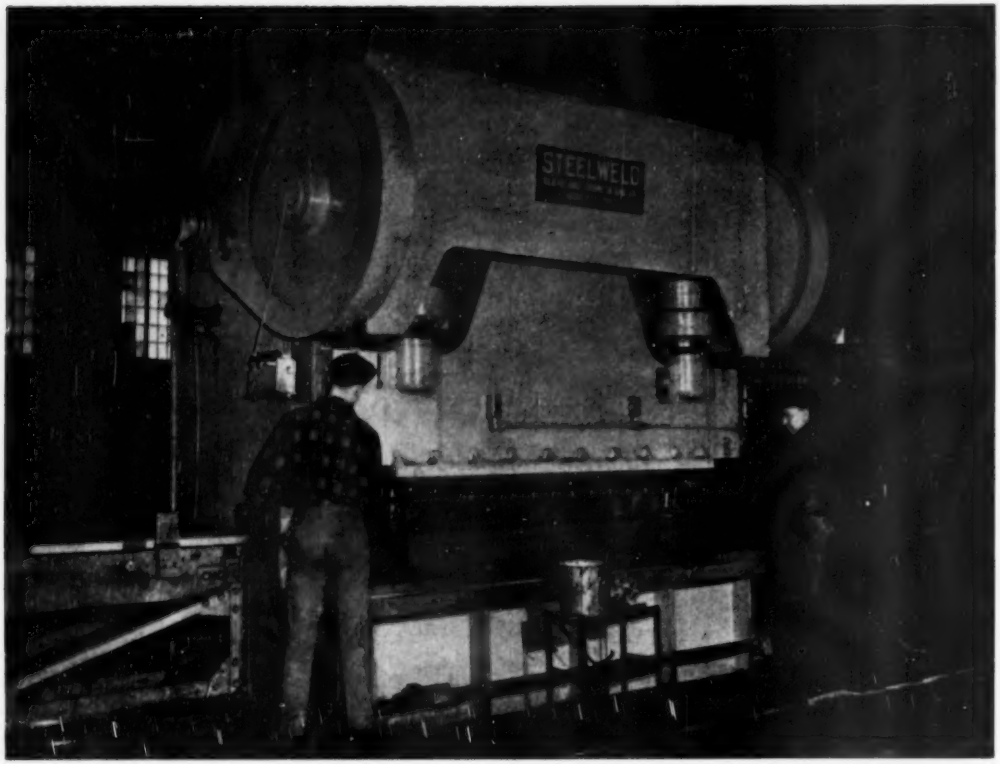

Model KS-8 Press, one of two Steelwelds in continuous 24-hour service since 1945, punching a series of holes in bridge floor bars.

2,000 Bars slotted every 8-Hour shift

Although originally conceived as machines for bending metal, Steelweld Presses are now serving a wide variety of uses. Two large Steelwelds at the MacDonald, Ohio Plant of the Carnegie-Illinois Steel Corporation are used solely for punching slots in steel bars, beams and T-sections for bridge flooring.

The time of one press is devoted largely to punching slots in bars 1⅜" and 1-7/16" wide by ¼" thick by 6'-2" long. Each bar contains 13 slots ½" wide by ⅝" to ⅞" long, and 24 slots ¼" wide by ⅝" to ⅞" long, a total of 37 slots all punched at one time. Two thousand bars are slotted in an eight hour shift.

Another standard job is that of punching 2-inch long slots on 4-inch centers in I-beams for bridge sections. These are punched 24 at a time. The beams vary in length from 24'-0" to 45'-0". Two hundred 40'-0" beams are punched in an 8-hour period.

Both Steelweld Presses have been in this service 24 hours a day since 1945.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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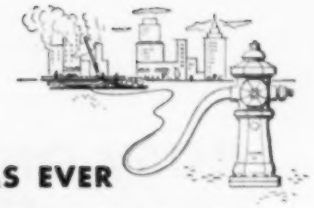
STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING



NO LUDLOW FIRE HYDRANT HAS EVER FAILED IN LINE OF DUTY!

Everdur stems resist stresses, strains and corrosive attack

Everdur* has helped to endow many types of products with the same time-tested reliability of performance of which the makers of these Ludlow Fire Hydrants are so justifiably proud.

Everdur,* The American Brass Company's group of Copper-Silicon Alloys, has long demonstrated its ability to resist corrosion while at the same time providing strength, toughness and unusual fatigue resistance plus easy workability and weldability. It provides many of the properties required for tin-bronze application.

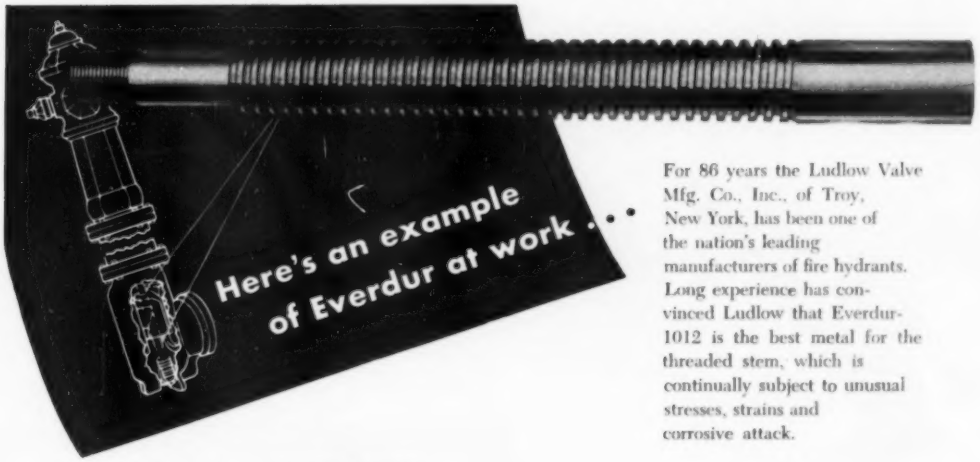
Tell us what you make – and how it is to be used. We'll do our best to help you get the right metal. It may be Everdur or one of a dozen different ANACONDA Alloys. Address The American Brass Company, General Offices, Waterbury 20, Connecticut.

*Reg. U. S. Pat. Off. 5289

EVERDUR is produced in nearly all commercial forms including casting ingots for remelting. It offers:

High Strength and Toughness
Unusual Fatigue Resistance
Excellent Corrosion Resistance
Weldability plus *Workability*
Machinability

Publication E-5 gives Applications, Physical Properties and Constants of Everdur. Publication E-1, on Everdur Casting Ingots, describes Foundry Practice and Procedure. Write for either or both.



Here's an example of Everdur at work . . .

For 86 years the Ludlow Valve Mfg. Co., Inc., of Troy, New York, has been one of the nation's leading manufacturers of fire hydrants. Long experience has convinced Ludlow that Everdur-1012 is the best metal for the threaded stem, which is continually subject to unusual stresses, strains and corrosive attack.

The Everdur-1012 (free-cutting alloy) stem, used in the Ludlow Hydrant, is 15" long with a 1-5/16" –4 square-cut thread.

EVERDUR

ANACONDA®

COPPER-SILICON ALLOYS

STRONG • WELDABLE • WORKABLE • CORROSION-RESISTANT

easy on
easy off
with OIL

the easy
bearing mounting
and removal system
pioneered by SKF

SKF®
BALL AND ROLLER BEARINGS

No designer today has to be sold on the advantages of anti-friction bearings. However they used to pose one serious problem to machine designers — that of the difficulty of mounting and removing interference fits, especially in bearings of comparatively large size. *Not so today.*

In the System of Hydraulic Removal, developed by SKF, OIL does the work. With simple equipment, you force oil between the shaft and the bearing, pressure breaks the fit, and the bearing slides off quickly, easily, safe from damage to bearing or housing. The same system eliminates the need for driving the tapered bore bearing *on* the shaft, or heating to obtain a shrink fit.

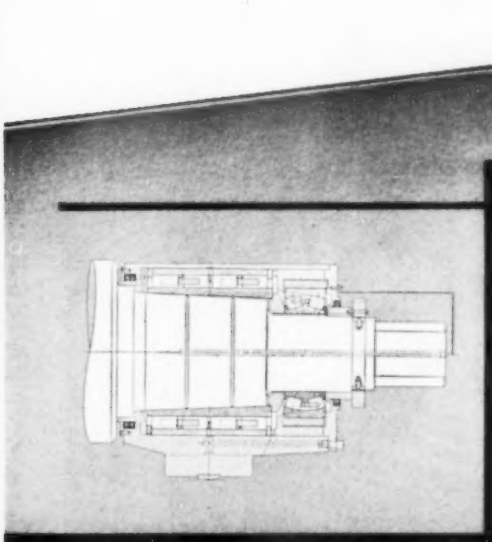
The accompanying illustrations show a few of the successful applications of this SKF principle —on roll neck bearings in steel mills, printing cylinder and paper mill roll bearings, on "OK" Shaft Couplings, main and crank pin bearings in air compressors. The principle is also well suited to other equipment such as crushers, construction machinery, etc.

SKF's first patent application on the hydraulic mounting principle was made in 1943.

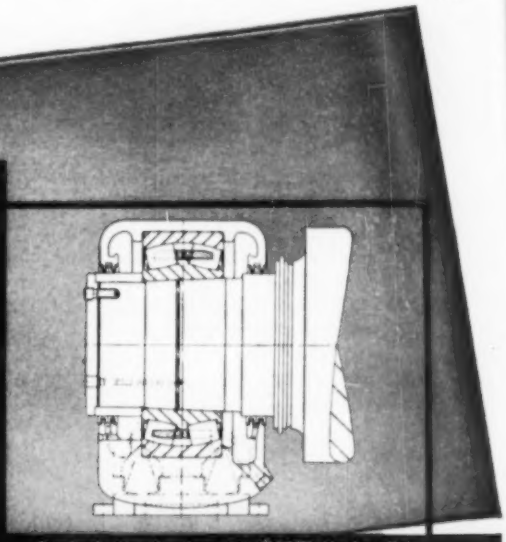
Since then, more and more equipment designers are taking advantage of this SKF "first." For further details, write for SKF Brochure No. 344.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA. —*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*

7361

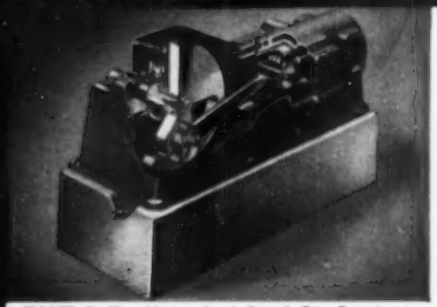


Typical Application Of SKF Hydraulic Mounting For Roll Neck Bearing.



Typical Application Of SKF Hydraulic Mounting For Printing Cylinder And Paper Machine Roll Bearing.

"OK" Coupling On 7 3/8" Marine Shaft, Depends On Pressure Only To Transmit Torque. Separable By SKF Hydraulic System.

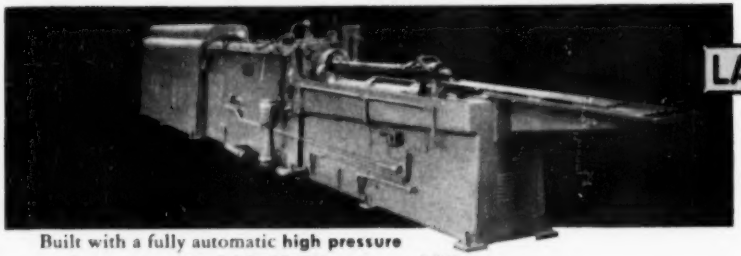


SKF Roller Main And Crank Pin Bearings With Hydraulic Mounting Feature On A Pneumatic Compressor.

Most ECONOMICAL *Installation*

for RIFLE-BROACHING 20 MM GUN BARRELS

with production requirements up to 12 barrels per hour!



LAPOINTE

H P RIFLE BROACHING MACHINE

Large coolant reservoir

Magnetic filters

Sufficient pressure range (up to 1200 pounds)

Built with a fully automatic **high pressure** coolant system, this LAPOINTE-engineered HP type BROACHING MACHINE provides the **best possible surface finish** . . . and with one-man operation!

This machine is easy to load and unload, and economical to operate because it is practically automatic. Interlocking controls prevent malfunctioning. Versatile cutting speeds, ranging up to 30 fpm.

Write for Brochure HP-40-2.

Close-up view of Lapointe-designed fixtures, broaches, gun barrel, and non-ferrous tube for automatic breech return. Each broach has a pilot section, to follow previous cut.

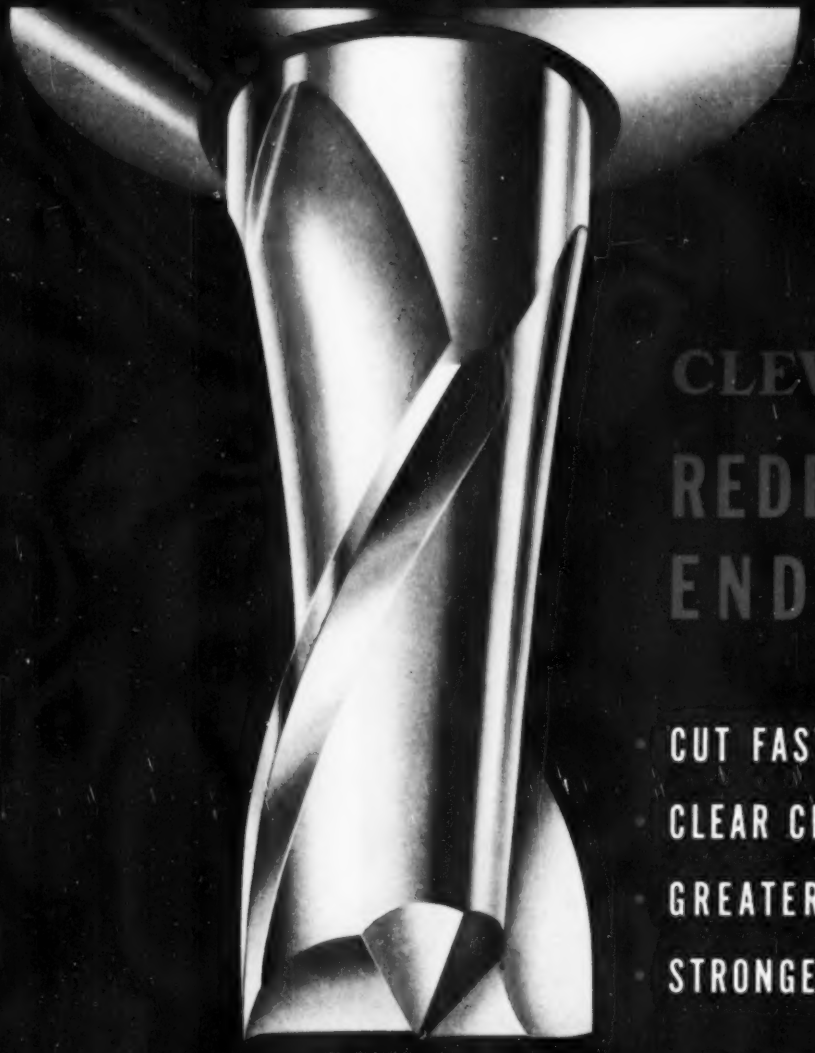
THE **LAPOINTE** MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

In England: Watford, Herts., England

LAPOINTE Made

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



CLEVELAND REDESIGNED END MILLS

- CUT FASTER
- CLEAR CHIPS BETTER
- GREATER ACCURACY
- STRONGER • MORE DURABLE

New flute shape reduces wear on the cutting edge . . . gives maximum cutting qualities at increased rates of feed.

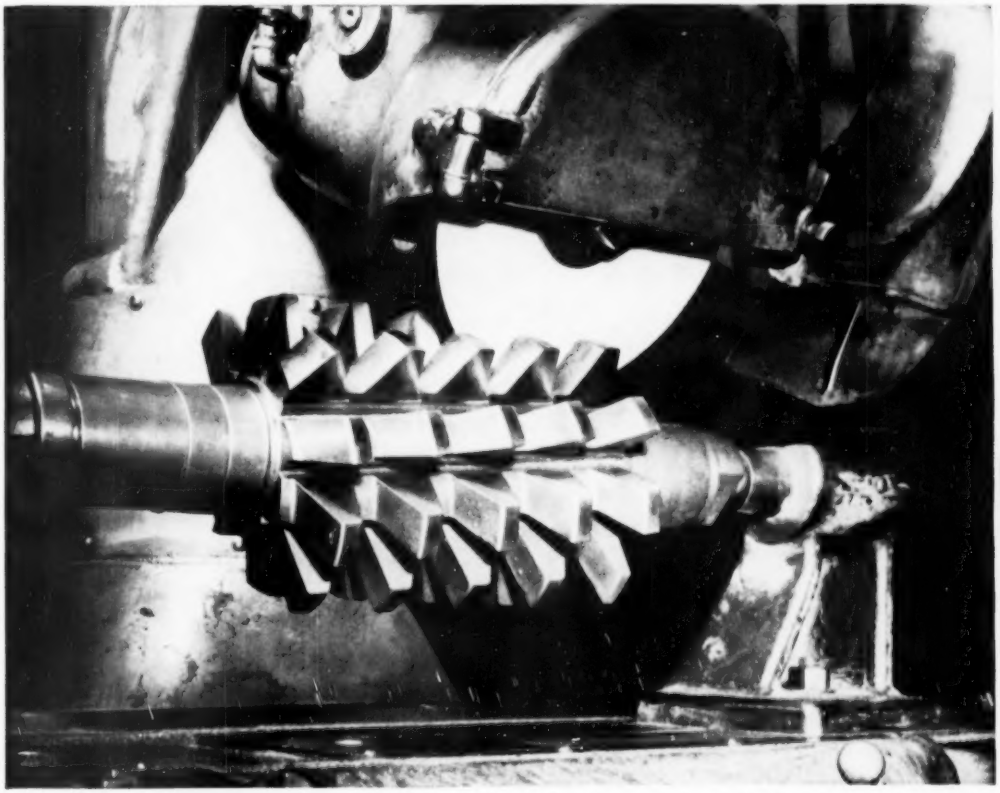
Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 7 • Chicago 6 • Dallas 7 • San Francisco 5 • Los Angeles 58

A. P. Barrus, Ltd., London W. 2, England

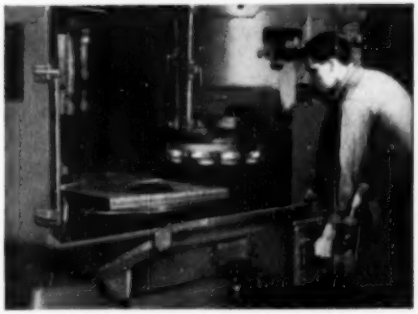


Large hobs with 1½" or greater pitch may be ground with a 10" x 1" x 1" WA464-J2V Robertson Wheel. On smaller hobs, a Robertson 7" x ⅝" x ¾" WA602-J4V will give satisfactory service. You can expect a greater saving in grinding time, due to proper chip clearance and cool, free cutting action.

GRINDING TIME HAS BEEN REDUCED AS MUCH AS 50% WITH ROBERTSON COOL-CUT GRINDING WHEELS

The record of Robertson Wheels has been outstanding. Users in hundreds of plants, performing many different operations, report that these unique open structure wheels reduce grinding time by 50 percent or more, increase production 3 to 5 times per wheel dressing, provide longer wheel life than conventional wheels.

For proof that Robertson Wheels take the toughest jobs in their stride, *blueprint* your grinding problem and let us recommend the proper wheel for your job. You'll like the results you get.



Removing .050" from one side of a 30" x 30" boiler plate required 45 minutes with a conventional grinding wheel. Equipping the surface grinder with a Robertson Cool-Cut Segmental Wheel reduced grinding time to 20 minutes. Robertson Wheels provide fast, cool cutting action on the toughest of operations.

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Three famous SIP Measuring Machines

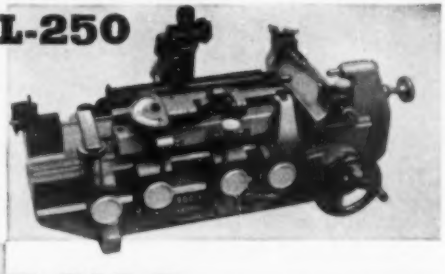
with built-in standard scales

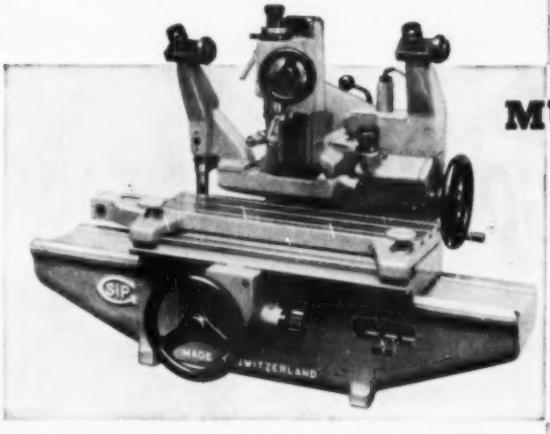
for absolute measurements to .00005 in.

SHOP GAUGE MEASURING MACHINE MUL-250

for the inspection of internal and external lengths and diameters, profiles, threads, etc.

Measuring range	10"
Maximum diameter to be measured	4"
Maximum length of threaded parts admitted	16"





MU-214 B THREE-COORDINATE UNIVERSAL MEASURING APPARATUS

for the inspection of all kinds of gauges, tools, components, internal and external threads, racks, etc.

Measuring range	16"×4"×6"
Dimensions of cost iron table	19 1/4"×5 1/8"
Dimensions of glass table	16 1/8"×4 1/4"

Rotary table for measurements in polar co-ordinates, dividing head, goniometric microscope, special microscopes for various purposes, etc.

A most versatile measuring apparatus

UNIVERSAL MEASURING MACHINE MUL-1000

for most accurate measurements (lengths, diameters, threads, tapers, etc.).

Measuring range . . 40"

Extensive set of accessories permitting to adapt the machine to all inspection requirements.

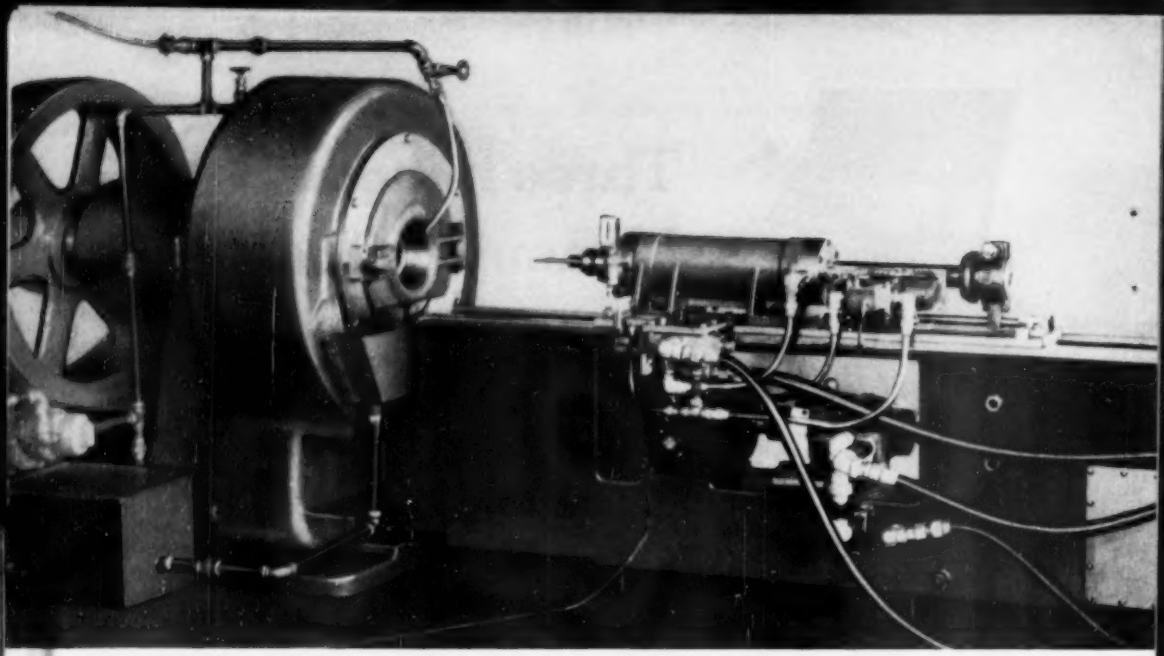
REPRESENTATIVE FOR U.S.A. AND CANADA:

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.

A83



FENN SWAGING MACHINE, featuring hydraulic feed, automatic chucking, and oil-cooled dies, is fast replacing lathes and screw machines for shaping a wide range of metal parts because it . . .

MAKES METAL GO TWICE AS FAR

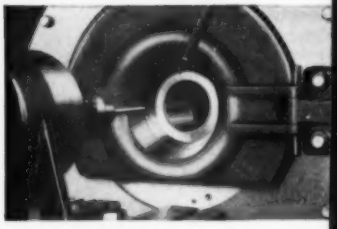
Yes, you can cut your metal requirements in half, in many cases, with this Fenn Swaging Machine. That's because it doubles the length of the blanks it shapes . . . with absolutely no stock removal.

MANY OTHER ADVANTAGES

What's more, this Fenn Swager produces a denser structure in metal parts . . . maintains concentricity . . . gives an improved finish . . . requiring no subsequent grinding . . . calls for less operator skill than any other machine capable of producing equivalent parts.

WRITE FOR SPECIFICATIONS

It will pay you to investigate all the cost-cutting, material-saving advantages of the Fenn Swager. Contact the Fenn distributor nearest you for facts and delivery schedules, or write direct to THE FENN MANUFACTURING COMPANY, 1859 Broad St., Hartford 1, Conn.



SIMPLE DIE CHANGES, using blanks in various diameters, make Fenn Swaging Machines quickly and easily adaptable to a wide variety of jobs. You can use them for reducing, pointing, or forming bar stock or tubing. Also for assembling fittings to cables. Fenn Swagers and Hydro-Formers come in sizes and designs for every swaging need.

FENN

Shaping metal for better and stronger products at lower cost

FENN MACHINES ARE SOLD BY:

ATLANTA
J. E. Wanaren
BALTIMORE
Refer: Calco Mach'y Co., Phila.
BIRMINGHAM
Quinn & Quinn
BOSTON
Refer: C. Taolin, Providence
BUFFALO
Syracuse Supply Co.
CHICAGO
Neff Kohlbusch & Bissell, Inc.
CINCINNATI
The Seifreat-Elsted Machinery Co.
CLEVELAND
Wm. K. Stamats Co.
COLUMBUS
The Seifreat-Elsted Machinery Co.
DALLAS
C. J. Harter, Machinery
DAYTON
The Seifreat-Elsted Machinery Co.
DETROIT
The Chas. A. Strelinger Co.
GRAND RAPIDS
Joseph Monahan
HOUSTON
C. J. Harter, Machinery
INDIANAPOLIS
State Machinery Co.
KANSAS CITY, MO.
Robt. R. Stephens Machinery Co.
LOS ANGELES
Hoffman & Hearst
MILWAUKEE
Neff Kohlbusch & Bissell, Inc.
MINNEAPOLIS
Northern Machinery & Supply Co.
NEW ORLEANS
Stauss & Maas, Inc.
NEWARK
A. C. Cook
NEW YORK
The Silvers Machinery Co.
NORFOLK
Tidewater Supply Co. Inc.
PHILADELPHIA
Calco Machinery Co.
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ROCHESTER
Syracuse Supply Co.
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C. P. Balotti Machinery Co.
ST. LOUIS
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SEATTLE
Star Machinery Co.
SYRACUSE
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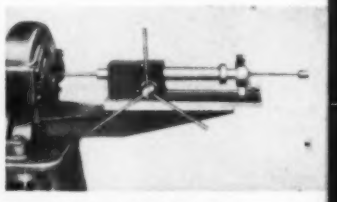
MONTREAL, QUEBEC
TORONTO, WINDSOR
Williams & Wilson Ltd
FOR EXPORT:
Indianapolis Machinery Export Co., Inc., New York, N. Y.



FENN FEEDING DEVICES, either manually or hydraulically operated, are available for all sizes of swagers. They speed up production and reduce operator fatigue.

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Vistac Oil

UNIT 72" open-side planer

OPERATION Machining heavy-duty metal parts

CONDITIONS Extreme pressures

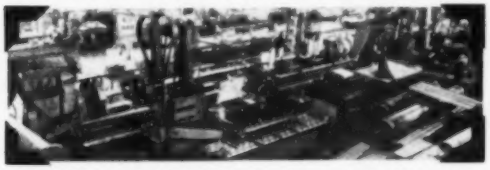
PERIOD 4 years

FIRM Lamb-Grays Harbor Co., Hoquiam, Wash.

Tacky oil on planer ways assures precision work!

WHEN CALOL VISTAC OIL replaced another lubricant on the main ways of this 72" open-side planer, its constant, even film helped to assure truer cuts for the Lamb-Grays Harbor Co., Hoquiam, Wash. Previous oils used by the company had gummed quickly, left deposits on ways, and seriously affected precision.

THE PRESSURE-RESISTANT FILM of Calol Vistac Oil stays on the ways even under extreme loads. For example, when work weighing up to 7½ tons was carried on the 10-ton bed of this planer, the "high-oiliness" film did not squeeze off, despite the 17½ ton load.



"NO TROUBLE OF ANY KIND" is the report from Lamb-Grays Harbor Co. since they changed to Calol Vistac Oil in 1948. Calol Vistac Oil is also used in reduction gears, motor heads, air-tools, and heavy-duty plain bearings. It comes in several grades and may be applied by wick-, ring-, or drip-feed oilers.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, is ready for you. Write or ask for your free copy today.

CALOL

How Calol Vistac Oil Cuts Costs on Metal-Machining Equipment

On machine ways, in hoist gear sets, motor gear-heads, air hammers, heavy-duty plain bearings—stays put and saves wear because of viscous, tacky nature. Atomizes quickly and stays fluid at low temperatures.

A. Special additives help form oily, pressure-resistant lubricating film...won't run off slow-moving parts.

B. Economical—small quantity will lubricate efficiently, dissipate heat.

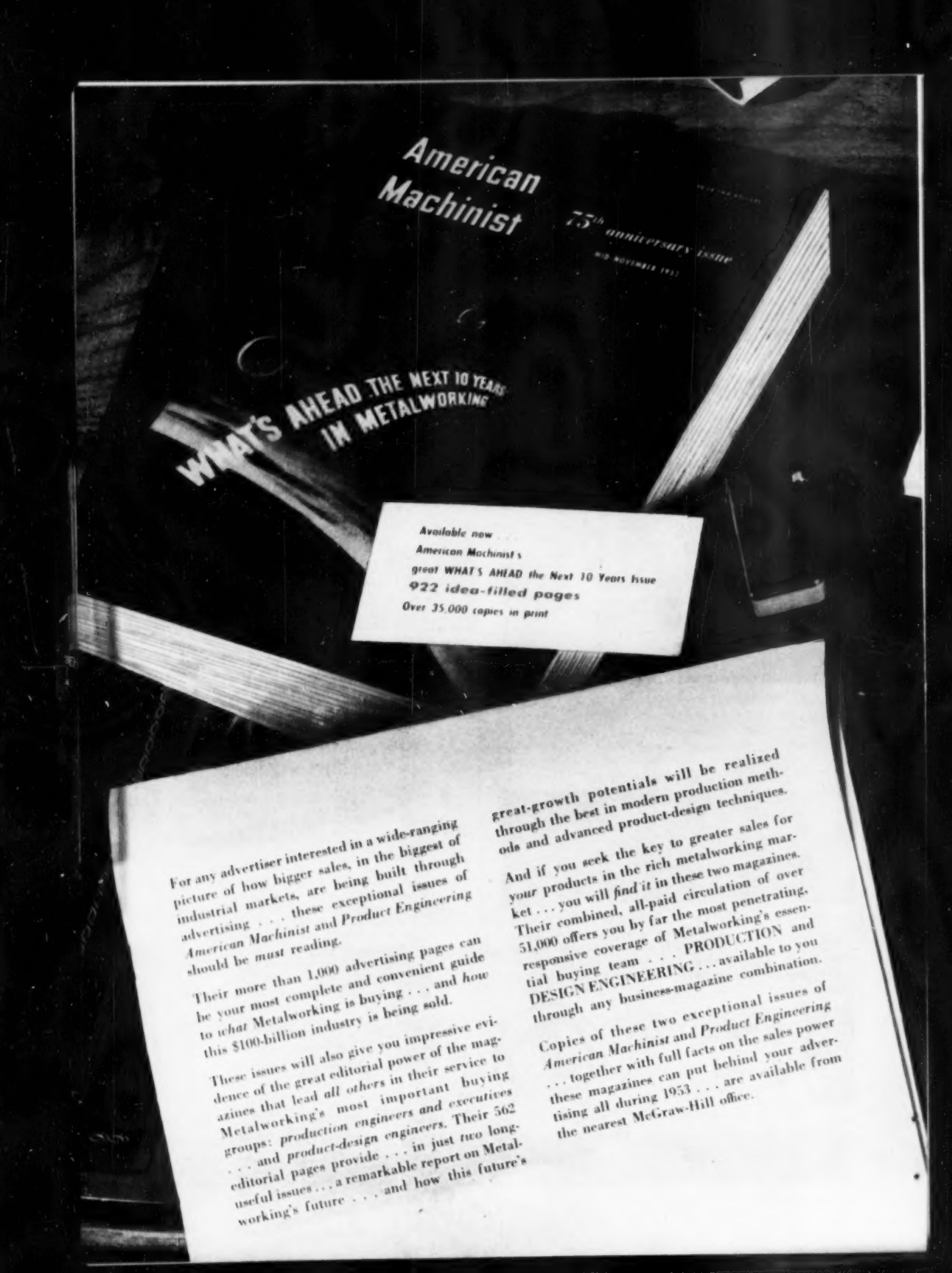
C. Tenacious film cuts power loss and wear.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas


American Machinist
75th anniversary issue
WHAT'S AHEAD THE NEXT 10 YEARS IN METALWORKING
Available now
American Machinist's
great WHAT'S AHEAD the Next 10 Years issue
922 idea-filled pages
Over 35,000 copies in print

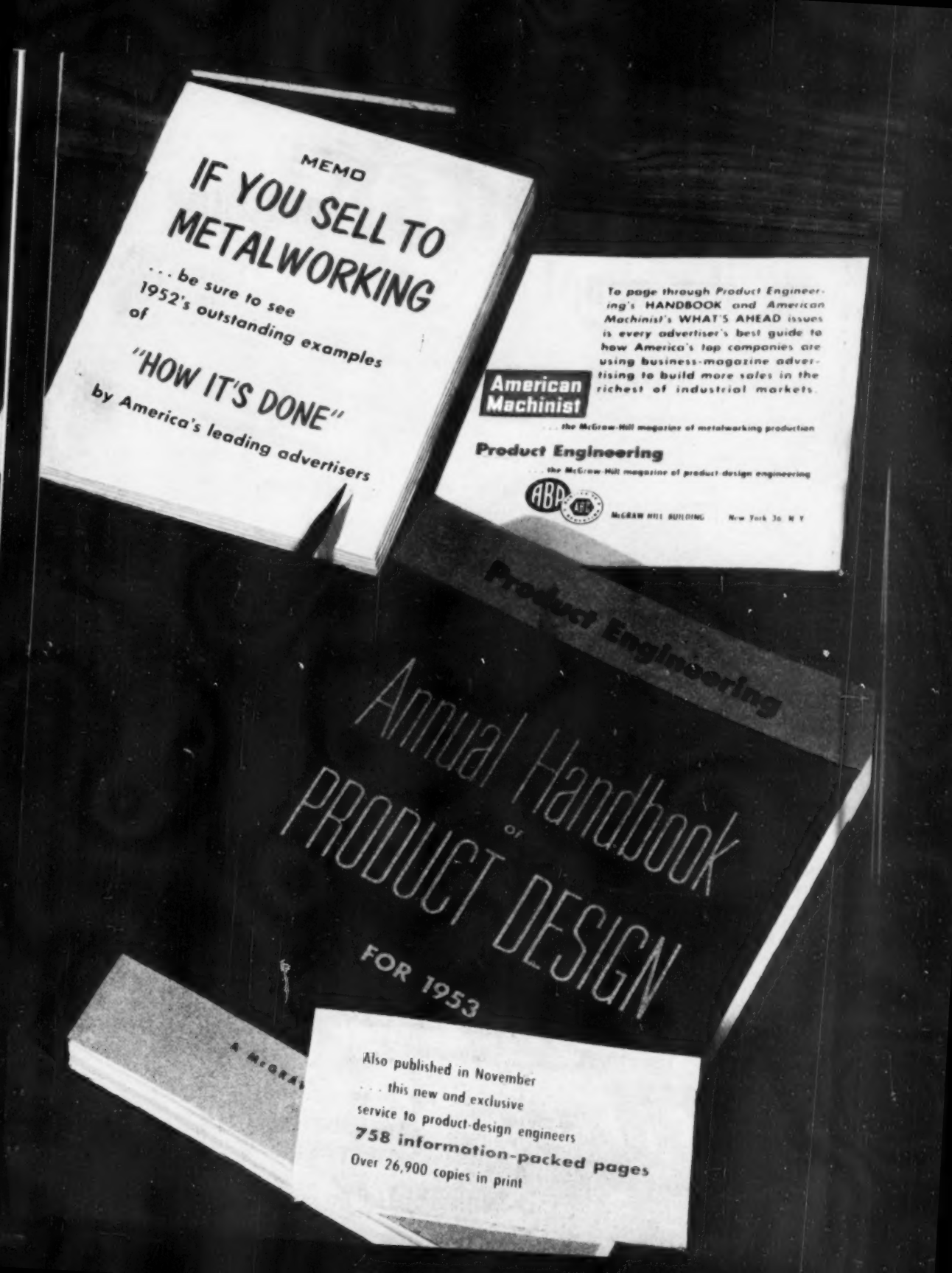
For any advertiser interested in a wide-ranging picture of how bigger sales, in the biggest of industrial markets, are being built through advertising . . . these exceptional issues of *American Machinist* and *Product Engineering* should be *must* reading.

Their more than 1,000 advertising pages can be your most complete and convenient guide to *what* Metalworking is buying . . . and *how* this $100-billion industry is being sold.

These issues will also give you impressive evidence of the great editorial power of the magazines that lead *all others* in their service to Metalworking's most important buying groups: *production engineers and executives* . . . and *product-design engineers*. Their 562 editorial pages provide . . . in just *two* long-useful issues . . . a remarkable report on Metalworking's future . . . and how this future's great-growth potentials will be realized through the best in modern production methods and advanced product-design techniques.

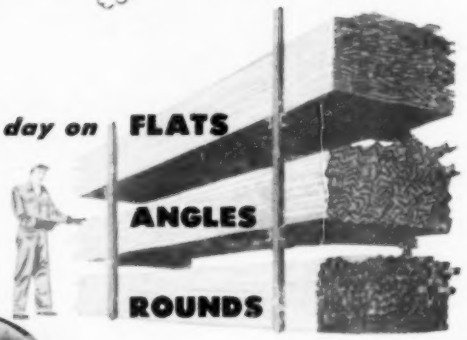
And if you seek the key to greater sales for *your* products in the rich metalworking market . . . you will *find it* in these two magazines. Their combined, all-paid circulation of over 51,000 offers you by far the most penetrating, responsive coverage of Metalworking's essential buying team . . . PRODUCTION and DESIGN ENGINEERING . . . available to you through any business-magazine combination.

Copies of these two exceptional issues of *American Machinist* and *Product Engineering* . . . together with full facts on the sales power these magazines can put behind your advertising all during 1953 . . . are available from the nearest McGraw-Hill office.


MEMO
IF YOU SELL TO METALWORKING
. . . be sure to see
1952's outstanding examples
of
"HOW IT'S DONE"
by America's leading advertisers
To page through Product Engineering's HANDBOOK and American Machinist's WHAT'S AHEAD issues is every advertiser's best guide to how America's top companies are using business-magazine advertising to build more sales in the richest of industrial markets.
American Machinist
. . . the McGraw-Hill magazine of metalworking production
Product Engineering
. . . the McGraw-Hill magazine of product design engineering
ABP
McGRAW HILL BUILDING
New York 36, N. Y.
Product Engineering
Annual Handbook of PRODUCT DESIGN
FOR 1953
A McGRAW
Also published in November
. . . this new and exclusive
service to product-design engineers
758 information-packed pages
Over 26,900 copies in print

It's the BUSIEST machine in the shop!

...gives more cuts per day on



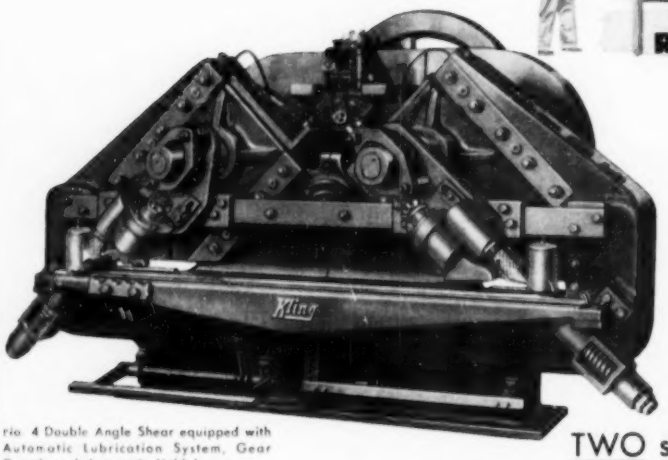


Fig. 4 Double Angle Shear equipped with Automatic Lubrication System, Gear Guards and Automatic Hold-downs.

Kling double angle shears

TWO shears in ONE machine!

If you're using obsolete, slow-poke methods of shearing, the Kling Double Angle Shear can help you save time and money. This modern compact machine is designed for high speed, high production shearing on both long and short run jobs. Many metal fabricating plants and steel warehouses have found the Kling Shear to be the workhorse of the shop. For instance, one machine will shear round bars and bar angles on the left side while the right side can be used for structural angles and flat bars. The machine is built with the speed and power to handle the bulk of your shearing requirements. For shops with considerable mitre shearing work, Kling Double Angle Shears can be mounted on a turntable to facilitate handling. Automatic hold downs and one-shot lubrication can be furnished when desired. Sizes to handle angles up to 8" x 8" x 1½".

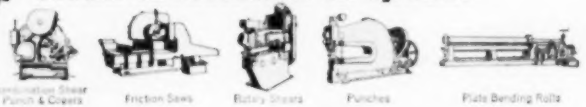
WANT TO CUT SHEARING COSTS?

Find out how this high-production machine, available in four sizes, can give you more cuts, cleaner cuts on your shearing operations. Write for more information and latest bulletin. Kling Bros. Engineering Works, 1318 North Kostner Avenue, Chicago 51, Illinois.

SEND FOR NEW BULLETIN 2345.

In our 60th Year

Kling ***...an investment in speed!***



Croblox

(CHROME CARBIDE)

It's New!

Superior Corrosion Resistance!

Same Expansion as Steel!

WRITE FOR FOLDER

Webber

GAGE BLOCKS

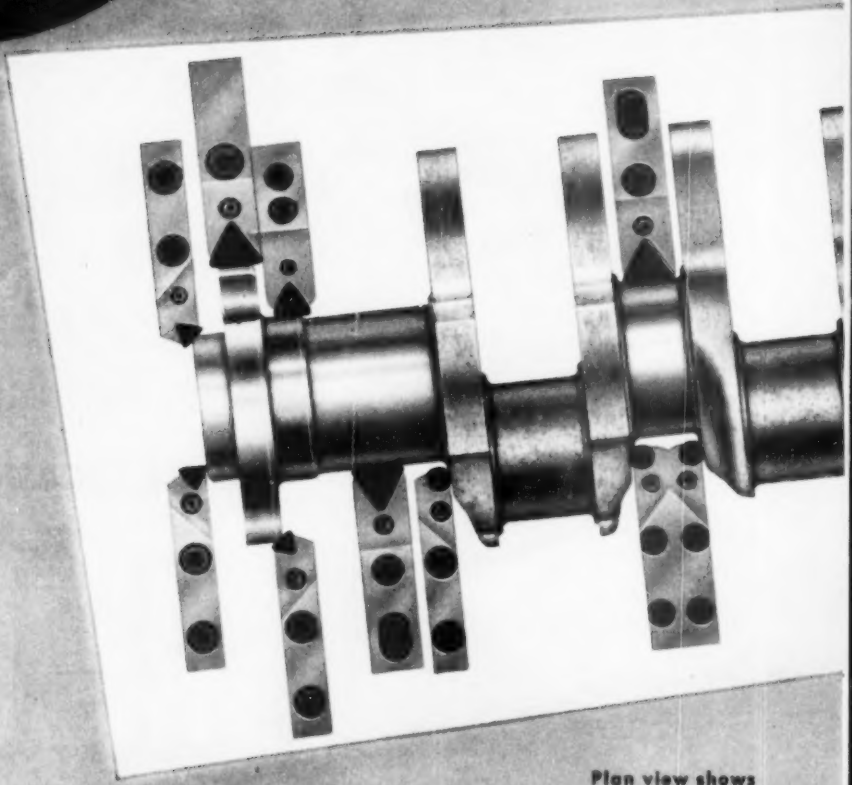
Largest exclusive manufacturer of gage blocks

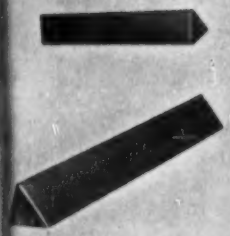
WEBBER GAGE COMPANY
12901 Triskett Road, Cleveland 11, Ohio

WESSONMETAL
TUNGSTEN-CARBIDE

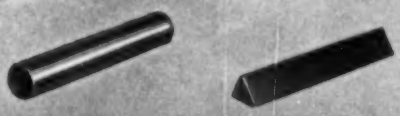
WESSON TOOL HOLDERS

First.





Wessonmetal—the cemented carbide giving users phenomenal performance throughout industry—turns to new successes on this difficult crankshaft turning job. Look at the production increase, the increase in pieces per tool change, the long, more efficient tool life possible with Wessonmetal.



Plan view shows position of front and rear tools only.

WESSONMETAL

WESSON METAL CORPORATION
LEXINGTON 34, KENTUCKY

TO TURN CRANKSHAFTS

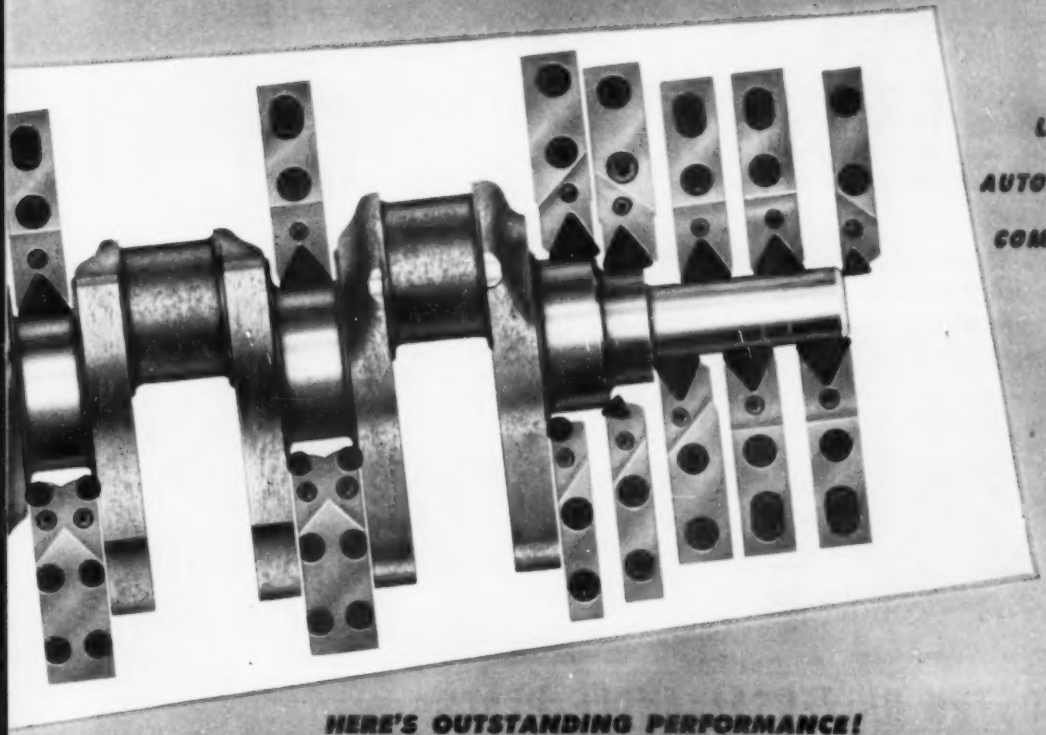
with CARBIDE INSERT TYPE TOOLS

USING WESSON BAND TYPE TOOL HOLDERS

and WESSONMETAL SOLID CARBIDE INSERTS

ON LeBLOND AND WICKES LATHES

NOW RUNNING AT ONE OF THE LARGEST AUTOMOTIVE COMPANIES



HERE'S OUTSTANDING PERFORMANCE!

AN AVERAGE OF 9000 PIECES PER INSERT BEFORE SHARPENING

OLD METHOD	
Pieces	11 per hour
Cycle Time	1 min. 55 seconds
Cranks per tool change *(average)*	1.7 pieces

NEW WESSON METHOD	
Pieces	48 pieces per hour
Cycle Time	40 seconds
Cranks per tool change *(average)*	1500 pieces

WRITE FOR *Complete Story* with DRAWINGS

WESSON COMPANY

1220 WOODWARD HEIGHTS BLVD • FERNDALE (DETROIT 20), MICH.

Your best work
Your fastest work

WITH THESE

ACCURATE TAPS

Today's State of Emergency calls for a doubling of efforts to conserve. An important step in this direction is the use of REIFF & NESTOR Taps. Your best work, and fastest work, is accomplished by their application, as industry has discovered through the use of REIFF & NESTOR Taps for the past forty years.

Your machine set-ups will run longer because of the quality heat treating and accurately controlled grinding that puts L-I-F-E into our products.

Remember, your best work results only if your Taps are perfectly accurate. REIFF & NESTOR Taps assure you of this.

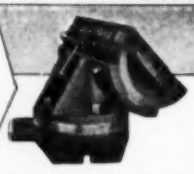
REIFF & NESTOR COMPANY

Tap Making Authorities

LYKENS • PENNSYLVANIA

BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool that Holds Work at Any Desired Angle.



Puts Speed and Profit Into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

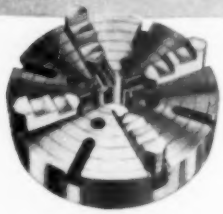
Made in several stock sizes.

Write today for full information.

US AUTOMATIC BOX MACHINERY CO., Inc.

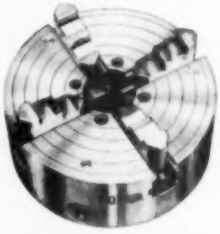
40 ARBORETUM ROAD • BOSTON 31, MASSACHUSETTS

HORTON CHUCKS



quality

performance



satisfaction

...for 101 years!

See your Horton Distributor for a complete line of standard chucks and specials for every application.

HORTON CHUCK

DIVISION OF

THE E. HORTON & SON CO.

WINDSOR LOCKS, CONN.

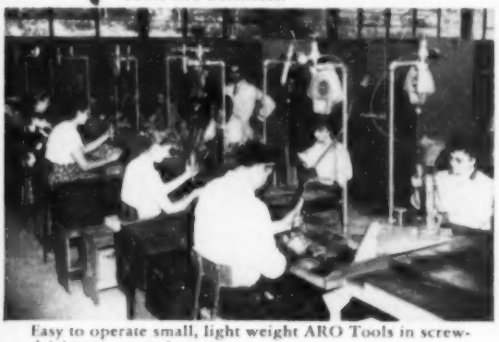
ARO

AIR TOOLS help LIONEL Speed-up Christmas Production!

Small size, light weight makes ARO Tools handy for close-quarters assembly.

SCREWDRIVING . . . another assembly job done faster with Aro Tools!

NUTSETTING is simple, speedy, with Aro Tools and Balancers.



Easy to operate small, light weight ARO Tools in screwdriving or nutsetting.

DRILLING with Aro Tool saves time in assembling toy locomotives.

Here are some of the many ways that ARO Air Tools keep production rolling for Lionel Corporation . . . assembling a great variety of toys in their plant at Irvington, N. J.

Let an ARO Field Engineer help you solve production problems in screwdriving, nutsetting, grinding, sanding, drilling, mixing, etc. Write ARO or see your ARO distributor.

The Aro Equipment Corp., Bryan, Ohio
Aro Equipment of Canada, Ltd., Toronto, Ont.

ARO

The Leader!
AIR TOOLS

Also . . . LUBRICATING EQUIPMENT . . . HYDRAULIC EQUIPMENT . . . AIRCRAFT PRODUCTS . . . GREASE FITTINGS

For your special spot welding jobs

choose MALLORY

COLD FORMED ELECTRODES

They're tougher

because they are bent cold from full hard rod stock . . . retaining maximum physical and mechanical properties, which can't be equalled by cast or forged electrodes.

They last longer

because cooling water goes all the way to the welding face . . . even on double-bent electrodes. Water tube is bent in place.*

They run cooler

because fluted† cooling water hole—an exclusive Mallory feature—has 70% greater cooling area for higher heat transfer efficiency.

Wide Selection of Shapes

You can probably find *the* electrode for your application in the scores of standard shapes available from Mallory. If you need a special style, send a sketch of your requirements . . . and Mallory will design and cold-form electrodes to your exact needs.

Write or call Mallory today . . . or get in touch with your distributor.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

CUT YOUR WELDING COSTS WITH THESE MALLORY PRODUCTS

In addition to electrodes, Mallory offers a full line of holders, dies, castings, forgings, rods and bars for every resistance welding application.

Backed by Mallory's 25 years of experience in resistance welding, these products have earned a world-wide reputation for high production and low-cost operation.

Rely on Mallory . . . for welding equipment and for sound, field-proved engineering service.

*U. S. Patent 2,489,993 †Patent pending

P. R. MALLORY & CO. Inc.

MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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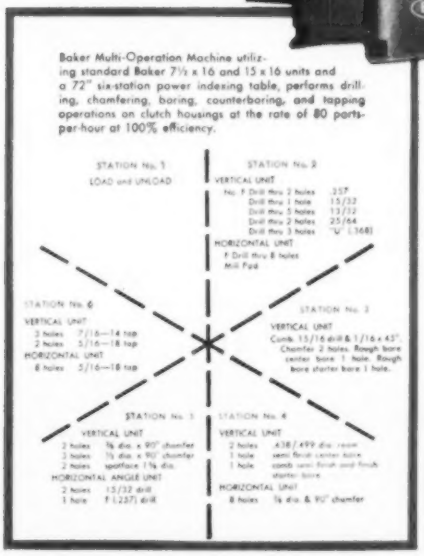
P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

For information on titanium developments contact Mallory-Sharon Titanium Corp., Niles, Ohio.

ANOTHER
COMPLEX
DRILLING PROBLEM **SOLVED**

with a **BAKER** SPECIAL MACHINE

Baker Multi-Operation Machine utilizing standard Baker 7½ x 16 and 15 x 16 units and a 72" six-station power indexing table, performs drilling, chamfering, boring, counterboring, and tapping operations on clutch housings at the rate of 80 parts-per-hour at 100% efficiency.


STATION No. 1
LOAD and UNLOAD
STATION No. 2
VERTICAL UNIT
No. F Drill thru 2 holes .257
Drill thru 1 hole 15/32
Drill thru 5 holes 13/32
Drill thru 2 holes 25/64
Drill thru 3 holes "U" (.368)
HORIZONTAL UNIT
F Drill thru 8 holes
Mill Pad
STATION No. 6
VERTICAL UNIT
3 holes 7/16—14 tap
2 holes 5/16—18 tap
HORIZONTAL UNIT
6 holes 5/16—18 tap
STATION No. 3
VERTICAL UNIT
Comb. 15/16 drill & 1/16 x 45° Chamfer 2 holes. Rough bore center bore 1 hole. Rough bore starter bore 1 hole.
STATION No. 5
VERTICAL UNIT
2 holes ⅛ dia. x 90° chamfer
2 holes ⅛ dia. x 90° chamfer
2 holes spotface 1¼ dia.
HORIZONTAL ANGLE UNIT
2 holes 15/32 drill
1 hole F (.257) drill
STATION No. 4
VERTICAL UNIT
2 holes .638/.499 dia. rough semi finish center bore
1 hole comb. semi finish and finish starter bore
HORIZONTAL UNIT
8 holes ⅛ dia. & 90° chamfer

Baker Special Drilling Machines, composed of standard Baker units arranged to suit each individual problem, are designed for *productivity*. Units arranged in vertical, horizontal and angular planes perform multiple operations *faster . . .better . . . automatically . . .* with greater accuracy and efficiency. Consult Baker engineers for a better solution to your drilling problems.

. . . SINCE 1867

BAKER BROTHERS, INC. Toledo, Ohio

DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

HOW TO MAKE A SOCKET-WRENCH

Wrench better

The steel shell of a mechanic's socket wrench has a tough job. The wall must be thin to slip over nuts in tight spots, the wrench must be strong and tough to keep its grip on the nut once the wrenching starts. The wrenches made by Herbrand have a reputation among mechanics for getting into close quarters and doing the job without slipping or giving.

Here's how Herbrand metallurgists and designers used Republic Steel 3-Dimension Metallurgical Service to pick the best Republic Alloy Steel to do the job . . .

Improvements in machinability on high-speed automatic machines were important . . . better hardenability of the finished wrench sockets was required . . . and production costs had to be kept down.

Herbrand metallurgists called in the Republic Field Metallurgist. Told him their problem. He went into a huddle with the other two members of the Republic 3-Dimension Metallurgical team . . . the Mill Metallurgist and the Laboratory Metallurgist.

The answer was soon ready . . . the recommendation of a certain one of the many grades of Republic Alloy Steels that would give Herbrand the desired machining and heat-treating characteristics, every time, lot-after-lot, at the necessary low cost.

You, too, can achieve quality improvements like this in your products . . . a call will bring the Republic Field Metallurgist into your picture.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

LAB FIELD MILL
3-DIMENSION Metallurgical Service

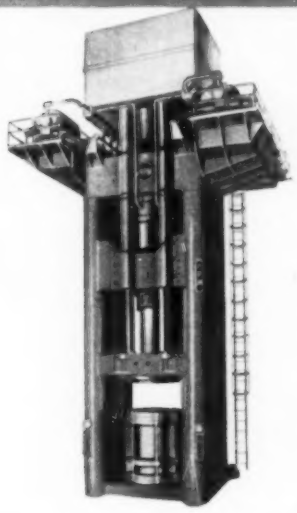
. . . combines the extensive experience and coordinated abilities of Republic's *Field*, *Mill* and *Laboratory* Metallurgists with the knowledge and skills of your own engineers. It has helped guide users of Alloy Steels in countless industries to the correct steel and its most efficient usage. IT CAN DO THE SAME FOR YOU.

Republic COLD DRAWN
REPUBLIC STEEL
ALLOY STEEL BARS

75th year

Serving Industry With All-Hydraulic Machines For Every Pressure Processing Need!

HPM



thank you . . .

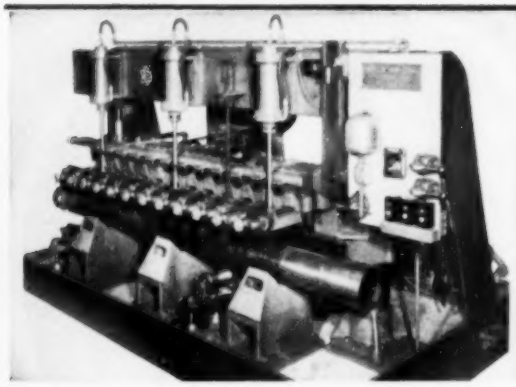
METALWORKING INDUSTRY . . . your continued confidence in H-P-M and the all-hydraulic presses and power equipment we build has made this our 75th anniversary possible.

Through advanced research and proper application of the knowledge we have gained through 75 years of specialized experience in our chosen field, hydraulics, we shall continue to design and build the all-hydraulic pressure processing equipment best suited to your requirements.

THE HYDRAULIC PRESS MFG. COMPANY

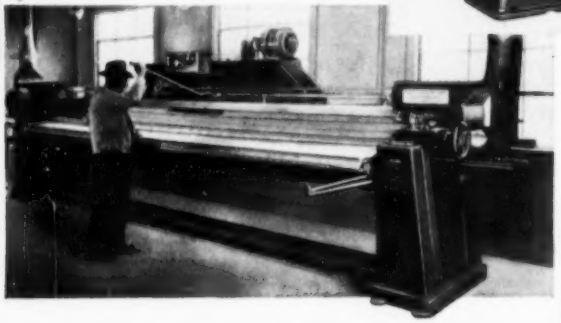
1002 MARION ROAD — MOUNT GILEAD, OHIO, U. S. A.

MORE COST-CUTTING APPLICATIONS OF VICKERS HYDRAULICS



Oil well casing slotting that formerly cost $1.25 per foot is now done at $0.90 per foot on the new machine designed and built by Allen Machine & Tool Co., Compton, California. Vickers hydraulic equipment raises and lowers the feed rail, controls feed rate and rapid traverse of cutters.

Hydraulic unit converted old belt sander to modern automatic stroke sander and reduced time for sanding pew backs from 15 minutes to 1½ minutes. Also improved quality. Built by Curtis Machine Corporation, Jamestown, N. Y. Vickers Hydraulics used exclusively.



This four-way, 38 spindle special purpose machine by Modern Tool Works, Ltd., Toronto, Ontario, does the drilling, spot facing and chamfering operations on an automobile engine head at the rate of one per minute. Vickers Hydraulic helps give it speed, control and precision.

Every day more and more machines are increasing production and cutting costs with the help of Vickers Hydraulics. See for yourself what Vickers Hydraulics can do for you . . . write for Catalog 5000 or call in a factory trained Vickers application engineer.

VICKERS Incorporated • 1410 OAKMAN BOULEVARD • DETROIT 32, MICHIGAN

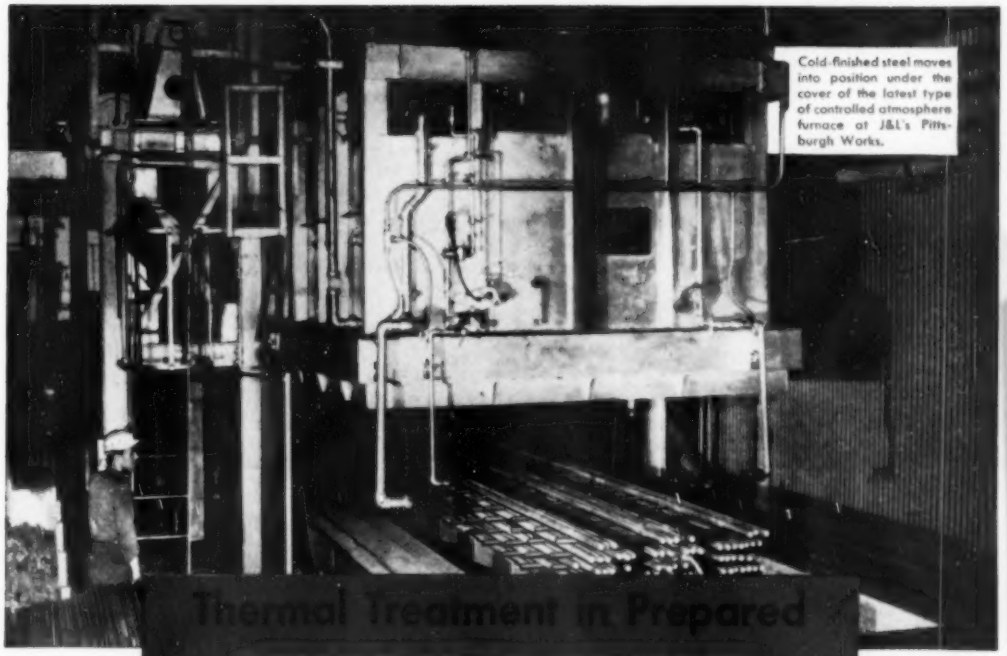
DIVISION OF THE SPERRY CORPORATION

Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND • DETROIT HOUSTON • LOS ANGELES (Metropolitan) • NEW YORK (Metropolitan) • PHILADELPHIA (Metropolitan) PITTSBURGH • ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

4763

Let J&L CARBON RESTORED Cold Finished Bars cut your production costs



Cold-finished steel moves into position under the cover of the latest type of controlled atmosphere furnace at J&L's Pittsburgh Works.

Thermal Treatment in Prepared ATMOSPHERE FURNACE saves you the cost of removing "Decarb"

Why incur the cost of removing "decarbed" surface from parts requiring high surface hardness? To eliminate these costs and lower your unit production cost, simply order J&L Cold-Finished Carbon Restored Bars.

This furnace is designed to permit other thermal treatments, such as annealing, normalizing, stress relieving and strain drawing. These treatments can be employed to improve machinability or to meet desired mechanical properties.

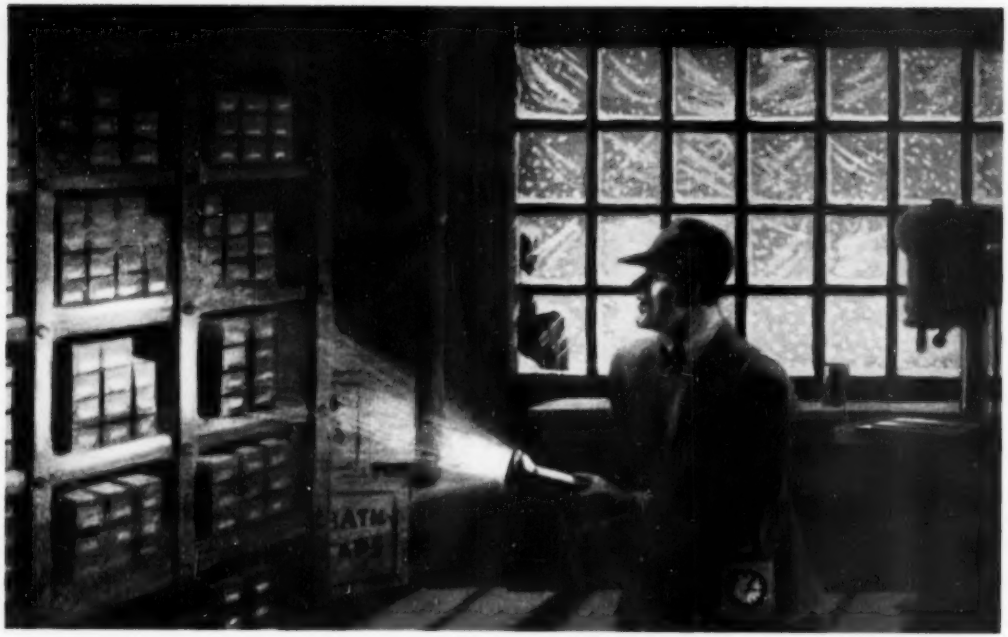
JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

J&L STEEL

Jones & Laughlin Steel Corporation
402 Gateway Center, Pittsburgh 30, Pa.

☐ Without obligation please send me your booklet "Extra Services to Users of Cold Finished Steel."
☐ Please have your representative call.

NAME _____
TITLE _____
COMPANY _____
ADDRESS _____



A TAP IN THE NIGHT

T'was the night before Christmas
And all through the plant,
Not a wheel was a-turning —
Not a sound to enchant.
'Til I came to a room
Where boxes piled high,
Gave proof that Bath Taps
Were in ample supply.

From inside each box
Came a sharp tapping sound.
A message in code —
Which I very soon found
Was a pledge of good-will
From the Bath factory,
Packed with each tap
As an extra, that's free.

T'was dreary and cold
Up there on the shelf —
And each tap tried hard
To un-wrap itself,
And spill this good-will
All over the place —
So there'd be enough
For the whole human race.

On the night before Christmas
Just take my advice.
If you hear a loud tapping
It won't be the mice,
But a message of good-will
Bringing Good Cheer,
To all Bath Tap friends
For another good Year.

INSIST ON BATH TAPS
— PROFIT BY THEIR
PLUS — PERFORMANCE

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

For positive, vibration-resistant SELF-LOCKING UNBRAKO SOCKET SET SCREWS

UNBRAKO Self-Locking Socket Set Screws won't work loose. Non-slip internal wrenching provides positive drive. Self-locking feature prevents creep and subsequent loosening. Machinery stoppage and production losses are materially reduced. Write for descriptive literature. STANDARD PRESSED STEEL Co., Jenkintown 1, Pennsylvania.

Standard UNBRAKO *Self-Locking Set Screws, #4 to 1" inclusive, are available from your* UNBRAKO *distributor's stocks. Ask him for your supply of these and other* UNBRAKO *threaded industrial fasteners.*

sps JENKINTOWN, PENNSYLVANIA

UNBRAKO® SOCKET SCREW DIVISION

CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

There is hardly anything in this world
that some man cannot make
a little worse and sell a little cheaper,
and the people who consider price only
are this man's lawful prey.
JOHN RUSKIN

Placed side by side, similar bushings of different make may look alike — *but are they?*

A·B·C Bushings are, and always have been made from only chromium, or chromium-tungsten oil hardening tool steels having wear resistance 18.5% greater than that of regular carbon water hardening tool steels.*

To capitalize fully on the inherent qualities of these finer steels, A·B·C Bushings are heat treated in one continuous automatic, electronically supervised operation with every step, including quenching, under a protective blanket of neutral atmosphere. This extra precaution insures high wear resistance right out to the initial working surface.

A·B·C Drill Bushings not only *last 18.5% longer,* but are *unexcelled for accuracy and concentricity.* That is why
A·B·C Bushings mean
More Holes Drilled per Dollar

A·S·A STANDARD

*See "A special American Machinist report to the metal working industries" © 1950 by McGraw Hill Publishing Company. Quoted by permission.

ACCURATE BUSHING COMPANY

MAIN OFFICE AND FACTORY:
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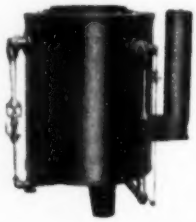
REPRESENTATIVES IN ALL IMPORTANT INDUSTRIAL CENTERS
WRITE FOR LITERATURE AND NAME OF YOUR LOCAL DISTRIBUTOR

BUZZER *Gas* FURNACES

NO BLOWER or POWER NECESSARY

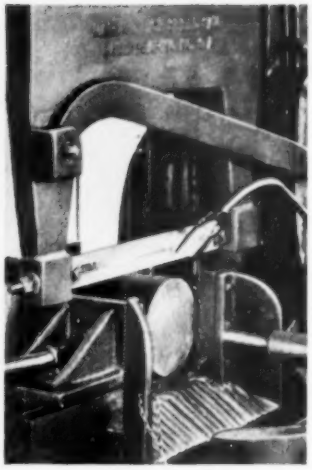


UP TO 1650° F. QUICKLY ATTAINABLE

Just connect to your gas supply and this BUZZER Atmospheric Pot Furnace is ready for operation. An innovation in design they are unbeatable for salt bath or lead hardening. Even heat, close control, high efficiency are only few of the many features. Available in many sizes.

Send today for the BUZZER catalog.

CHARLES A. HONES, INC



best metal cutter...
real cost cutter...

STAR "Moly"

High Speed POWER Hacksaw Blades

To cut your initial power hacksaw blade costs at least 15%, tell your Distributor you want STAR "Moly" High Speed Power Blades.

STAR "Moly" Blades give you an extra dividend, too—cutting that's been proved faster and more efficient.

Over the years, *quality* above all has made STAR Blades industry's *preferred* blade—top quality steel, carefully heat treated, manufactured on specially designed equipment, to give you fast, economical cutting and long blade life.

FAST, LOCAL SERVICE from your STAR Distributor's Stock

STAR "Moly" Blades are sold only through recognized Distributors—the men you know and have confidence in, the men who have inventories on hand to give you fast delivery where and when you want it. It is wise to buy whatever you can from your recognized Distributor.

1832
CLEMSON BROS., Inc.
MIDDLETOWN, N. Y., U.S.A.
Makers of Hand and Power Hack Saw Blades, Frames, Metal Cutting Band Saw Blades and Clemson Lawn Machines.

Jet Engines create *chucking problems*

The Cushman Chuck Company has engineered and designed an entirely new and tested approach to the problem of holding jet engine discs and rings. These new chucks have been developed in strict accordance with the principles of rapid-production techniques and chucking rigidity *without* distortion.

Designed for both hand and automatic chucking operations. Engineered to your requirements.

THE CUSHMAN CHUCK COMPANY
810 WINDSOR STREET
HARTFORD 2, CONNECTICUT

A WORLD STANDARD FOR PRECISION

CUSHMAN ALSO MANUFACTURES MANUALLY OPERATED CHUCKS, POWER OPERATED CHUCKS AND ELECTRIC POWER WRENCHES

19C093

SIGHTS SET FOR PRECISION HEATS...

Better FORGINGS

Midvale Quality Control From Furnace to Finish Assures Longer Service

From the time the scrap and pig iron are charged into the furnaces until the forging is machined to a precision finish Midvale craftsmen carefully control quality.

Weldless gear rings . . . hydraulic press cylinders . . . pressure vessels . . . hardened and ground steel rolls . . . all are produced to exact specifications at Midvale. Modern equipment, complete facilities, skilled and experienced men make a combination that America's industries have relied upon for almost a century for the finest in heavy steel forgings.

When heavy forgings must meet rigid specifications, rely on Midvale precision craftsmanship and engineering cooperation.

THE MIDVALE COMPANY
NICETOWN · PHILADELPHIA 40, PA.

Offices: New York, Chicago, Pittsburgh
Washington, Cleveland, San Francisco

MIDVALE

Custom Steel Makers to Industry

PRODUCERS OF FORGINGS, ROLLS, RINGS, CORROSION AND HEAT RESISTING CASTINGS

"Tycol Amulkut is the cutting oil for me . . . it really prolongs tool life"

That's 100% correct! Tycol Amulkut Cutting Oil speeds up production by permitting freer, faster cutting . . . assures uniformly finer finishes. It also cuts cost by reducing spoilage, and prolonging tool life . . . regrindings are few and far between.

Tycol Amulkut is readily emulsified, and is specially designed for use in this form . . . it is available in grades for normal and heavy-duty cutting.

For more information, call your nearest Tide Water Associated office.

TYCOL

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TIDE WATER ASSOCIATED OIL COMPANY

17 BATTERY PLACE · NEW YORK 4, N. Y.

SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"

AT WENDT-SONIS A LINDBERG INDUCTION HEATING UNIT

ups tool tip brazing 135% . . . replaces two units

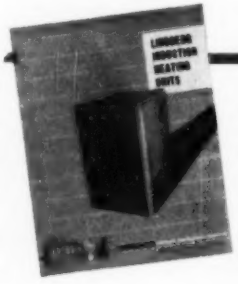
Production brazing of carbide tip tools has soared from 270 to more than 600 an hour since Wendt-Sonis, Hannibal, Mo., tool manufacturer, installed a Lindberg induction heating unit.

Two operators, fluxing parts and putting brazing metal and carbide tool tips in place, load the assemblies on a conveyor belt that passes a continuous stream of work through a specially designed, long hair-pin type heating coil.

Production is speeded because 14 tool assemblies . . . not just one . . . are in the heating field at any given time. The first tool on the conveyor passes *from* the heating area, leaving 13 others *still in* the field of heat, with tool number 15 *just entering* the coil area.

Production, formerly through two smaller units, totalled only 135 tools per hour, per unit, and required four operators. Thus the new equipment frees two operators for other important work.

If your requirements call for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, a Lindberg induction heating unit can better your production picture . . . minimize costs . . . increase profits.

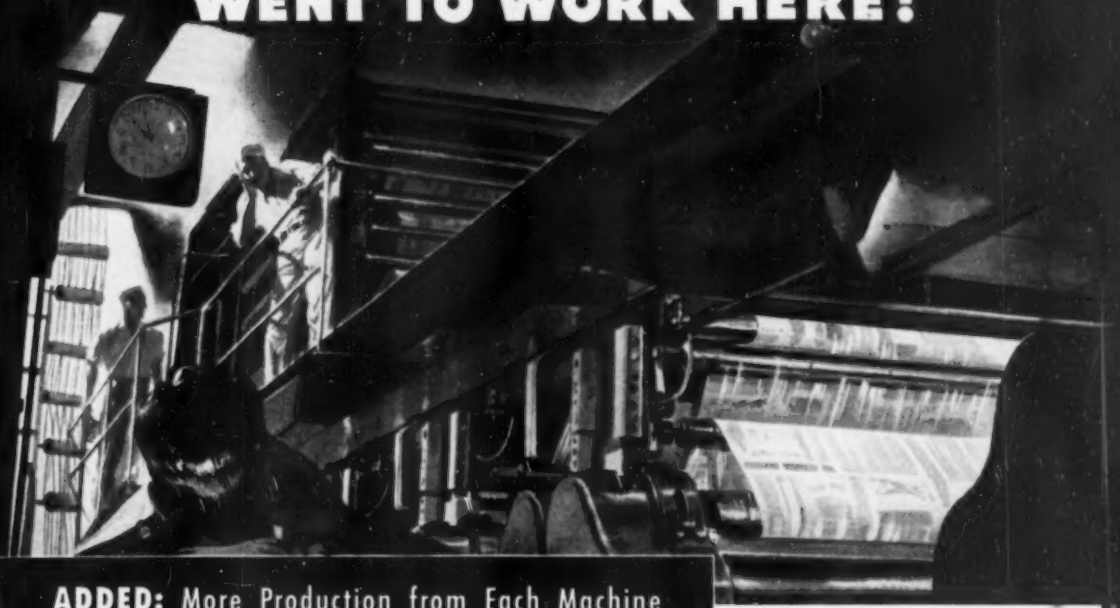


Ask for a copy of Bulletin 1440. It pictures and describes standard models . . . illustrates 11 cost reducing features . . . lists applications . . . shows accessory equipment.

LINDBERG **HIGH FREQUENCY DIVISION**

Lindberg Engineering Company, 2445 West Hubbard Street, Chicago 12, Illinois

Alemite "Friction Fighters" WENT TO WORK HERE!



ADDED: More Production from Each Machine

REDUCED: Stock Spoilage and Down-Time

SAVED: A Total of $4,247 Every Year

Friction was once a daily menace—and a costly one—in this Chicago plant.* Protected only by old-fashioned methods of lubrication, this company's mammoth high-speed presses were breaking down with alarming frequency. Stock spoilage was high. Oil consumption ran to $5,664 a year.

Then, a trained Alemite "Friction-Fighting" specialist was called in to work with the plant engineers. After a month's test on one press an Alemite Mechanized Lubrication System was installed on all five machines in the plant at a total cost of only $2,471.

Since that time, there has not been a single breakdown or bearing loss, stock spoilage and down-time have been greatly reduced, and lubricant cost has been cut to $1,417! This is an annual saving of $4,247, *in addition* to more production gained from each press, and a marked improvement in quality for increased customer satisfaction!

No matter what size or type of plant you operate, an Alemite Lubrication Engineer can show you dozens of ways of making worthwhile savings through more efficient handling of petroleum products. These are facts which you can readily confirm in your own time studies. The Alemite man will cooperate fully with your plant engineers in setting up a test. Contact your local Alemite Industrial Distributor, or mail coupon below—today!

*Name on Request.

ALEMITE

MEANS EVERYTHING FOR LUBRICATION

1. Methods 2. Lubricants 3. Equipment

For industry, Alemite Centralized Lubrication Systems add productive time to machines with faster, more efficient handling and application of lubricants.

Loading . . . transferring . . . applying! Alemite Mechanized Lubrication Methods save time, save work, keep lubricants refinery-clean barrel-to-bearing.

A PRODUCT OF SW STEWART WARNER

FREE! New Booklet

Please send me:

☐ "11 Ways to Cut Production Cost."

☐ Include Facts on OIL-MIST—the amazing new system that atomizes oil, circulates it to bearings under pressure.

ALEMITE, Dept. C-122
1850 Diversey Parkway, Chicago 14, Ill.

Name _____

Company _____

City _____ State _____

LET RIVERSIDE

help solve

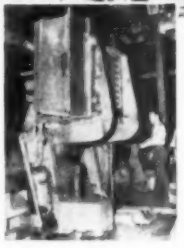
YOUR CASTING PROBLEMS

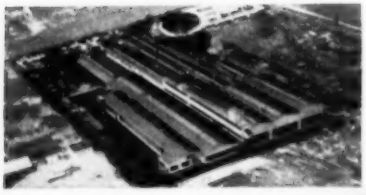
Riverside Foundry is ready to give you excellent service on cast armor and all types of QQS 681-B materials. In fact, any steel casting specifications for which your contract might call. We have a full staff of men who have spent years producing ordnance material.

Our customers include many great names of American Industry: Chrysler, American Locomotive, International Harvester, Fisher Body and Ford Motor Company. Ask them about Riverside.

Call or write us at Riverside today.

For a dependable qualified source of steel casting requirements, see Riverside. You give us your drawings. The rest of the job is ours. Save yourself time, worry and loss of production. We are ready to do a complete job for you on any casting requirement.



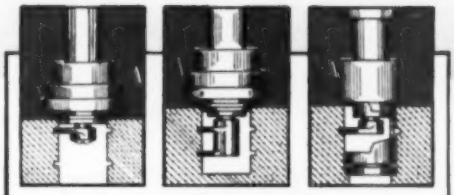


The big modern Riverside Foundry at Bettendorf, Iowa has the best equipment to do the best job.

Waldes Truarc Internal Grooving Tool

for precision cutting of internal grooves in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!



Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.

The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

Write now for new 12-page Catalog giving mechanical details, cutting sizes...extra features...full information

WALDES

TRUARC

REG. U.S. PAT. OFF.

GROOVING TOOL

WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N.Y.
Waldes Truarc Grooving Tool
Manufactured under U. S. Pat. 2,411,426

Waldes Kohinoor, Inc., 47-16 Austel Place Long Island City 1, New York AM-124

Please send me your new 12-page Catalog on Waldes Truarc Internal Grooving Tool.

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STOVE COMPONENTS
to
GARDEN TRACTOR HOODS

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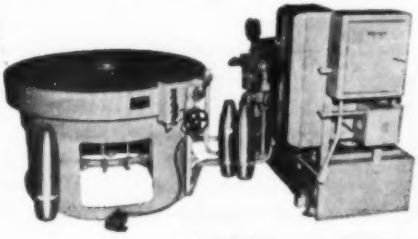

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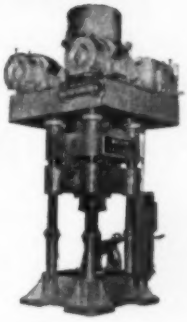

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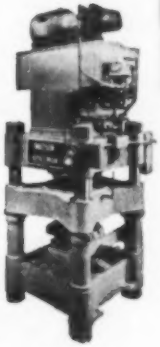

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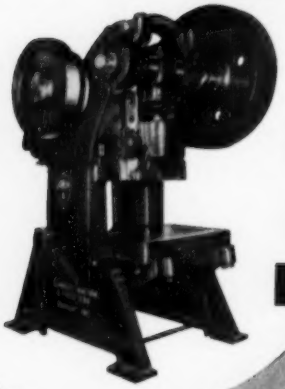

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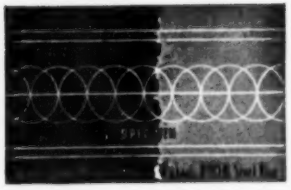

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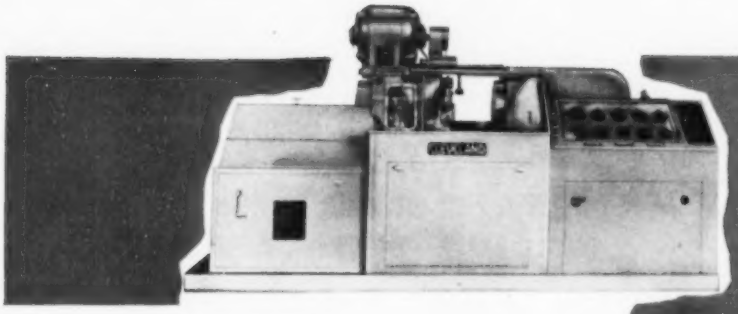

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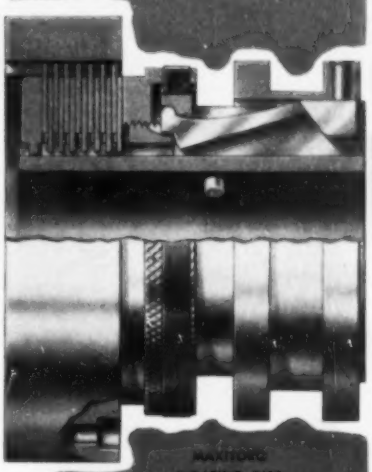

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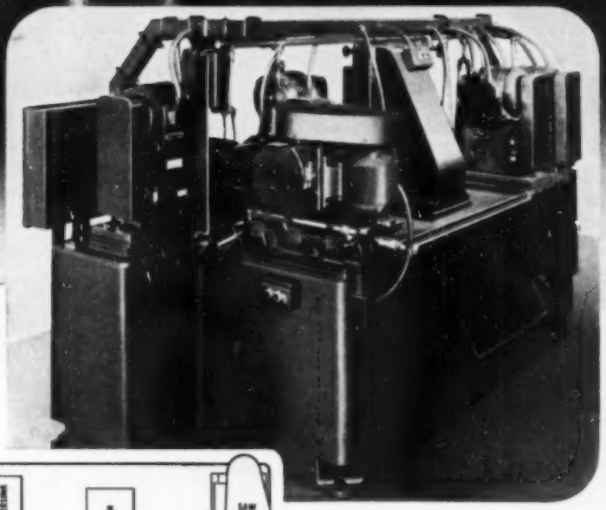

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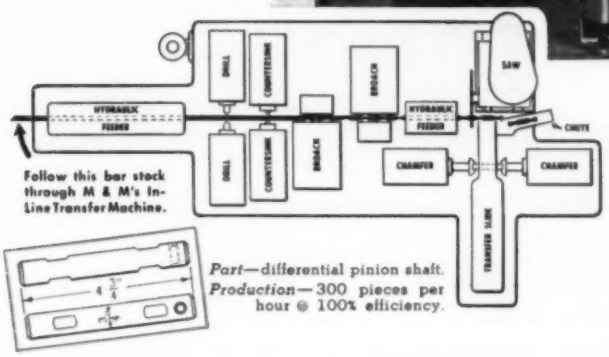

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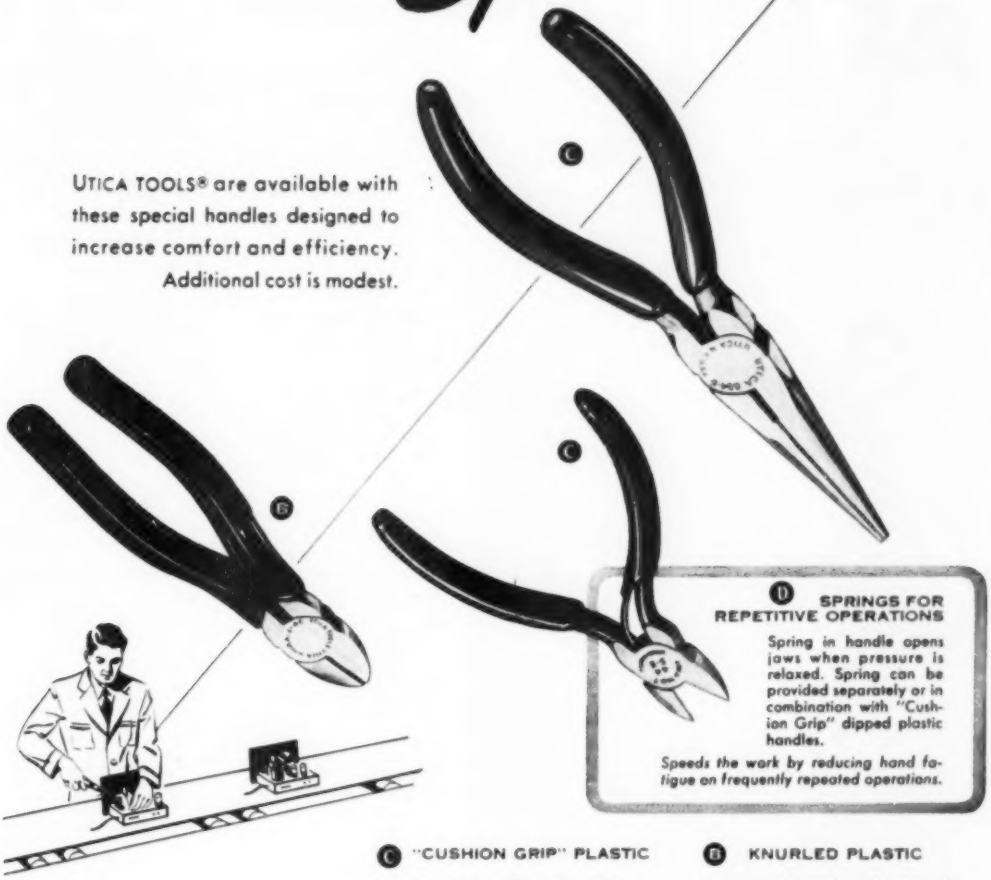

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Fig. 1

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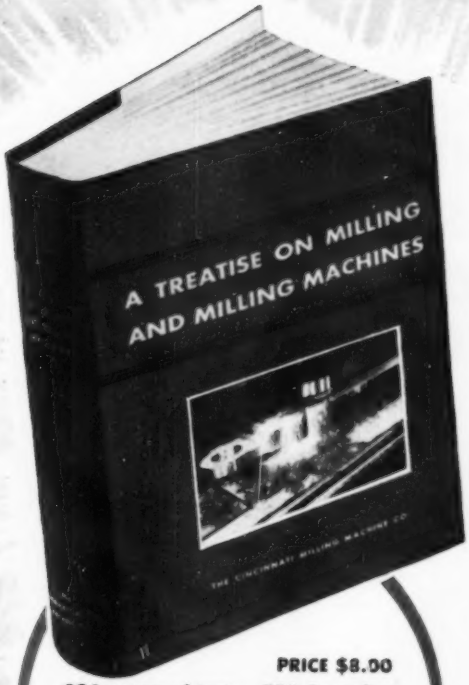

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9 Power Required in Milling
10 Mounting of Milling Cutters
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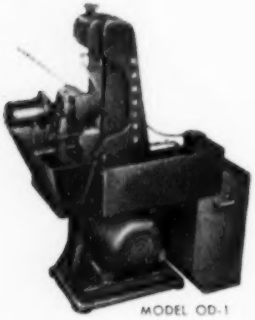

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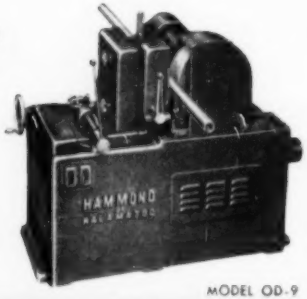

MODEL OD-9

SEND SAMPLES...

For a Complete Engineering Report on Your Work. Send Us One Finished and Several Rough Samples. No Obligation.

Hammond Machinery Builders INC.

1618 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

All the basic facts your NEW MEN need to know about Inspection Tools...

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Inspection Tools

12 pages — 20 cents a copy

This *American Machinist* Special Report, the latest in our series of defense training manuals, will help your new men to understand the common gages used for production inspection . . . what they are, how to use them, and how to care for them.

The report is intended primarily for men who have had little experience with inspection problems, but even your trained inspectors will find it useful as a refresher course.

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American Machinist

McGraw-Hill Building

New York 36, N. Y.

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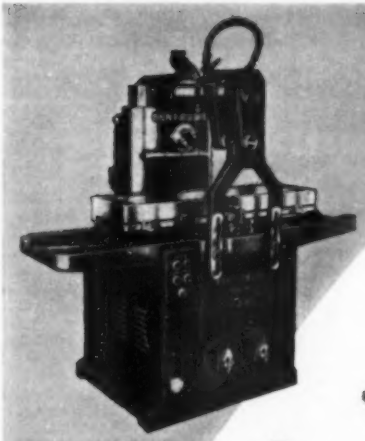
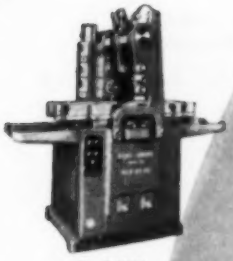
KENT-OWENS

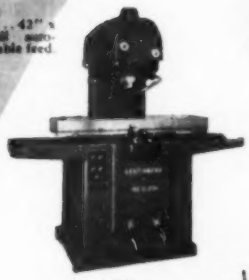


No. 2-30
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.



No. 2-30DS
Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.

Do your milling jobs *right*—with Kent-Owens Milling Machines! Designed with advanced features that mean outstanding *speed*, *accuracy* and *dependability* . . . Ruggedly constructed to maintain accuracy under hard use. Twin-post head mounting—an exclusive Kent-Owens feature—assures balanced load, no chattering. Simple in design and operation. Saves labor . . . reduces costs! Write for bulletins on wide range of hydraulic and hand-operated machines. Kent-Owens Machine Co., Toledo, Ohio.

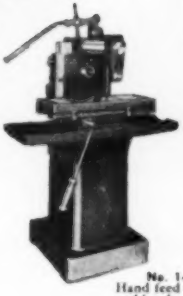


No. 2-30V
20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.

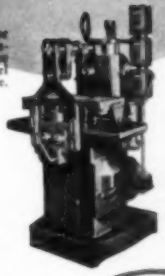
No. 2-14DS
Double Spindle for two milling operations at same time . . . 14" table travel . . . 32" x 9" table.

No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

No. 1-V
Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.



No. 1-M
Hand feed to table and head . . . 25" x 9" table . . . Adjustable head counter-balance.



No. 1-8
8" table travel . . . 25" x 9" table . . . automatic hydraulic table feed.

KENT-OWENS REPRESENTATIVES

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General Machinery Corp.
BUFFALO
Don W. Peterson
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DALLAS
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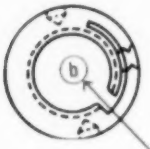
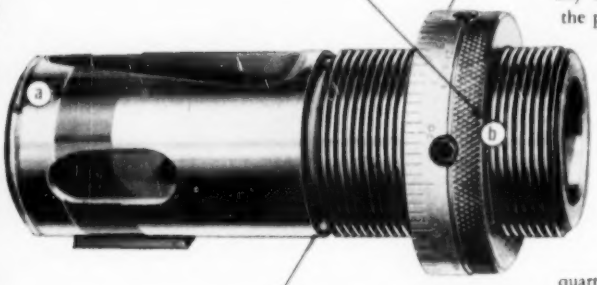
CALL ON KENT-OWENS FOR MILLING MACHINES

for Quick Adjustments on multiple spindles

use **S-J** SCULLY-JONES "QUICK-LOCK"
ADJUSTABLE ADAPTERS and SPINDLE EXTENSION ASSEMBLIES





a **MAKE QUICK TOOL CHANGES:**
The close fit between spindle and adapter body often causes adapters to bind or jam when being inserted. The *pilot nose* on these S-J Assemblies reduces this trouble to a minimum and speeds up tool changes. The *wider undercut* provides relief for any upsetting of the body caused by the press fit of the Woodruff key.

b **REDUCE SET-UP TIME:**
It is easy to make fine, individual adjustments with great accuracy in a cluster of spindles (or in a tool gaging set-up) with the "Quick-Lock" Nut locking any place on the adapter thread. This friction type nut locks by only a quarter turn of the set screw, which forces the locking shoe against the adapter thread. This feature saves time on every adjustment.

MEET TOOLING REQUIREMENTS:
The Adjustable Adapters are made in a wide range of standard sizes. The Spindle Extensions are made in two styles. Style 1800 has a small body diameter—ideal for operating on close centers, next to shoulders and other obstructions. Style 1900 has a larger body diameter in relation to its shank size. These Assemblies meet most requirements for extending spindles and altering existing multiple spindle set-ups.

Scully-Jones AND COMPANY

1902 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

WRITE FOR BULLETIN No. 6-50
Shows complete range of sizes, specifications and prices for Scully-Jones Adjustable Adapters and Spindle Extension Assemblies.

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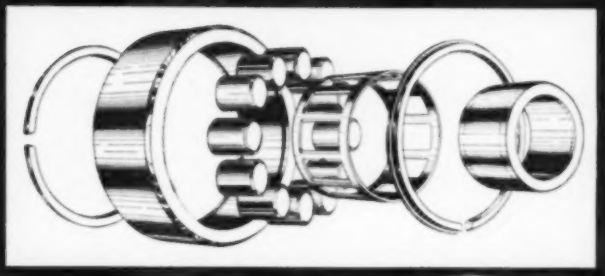
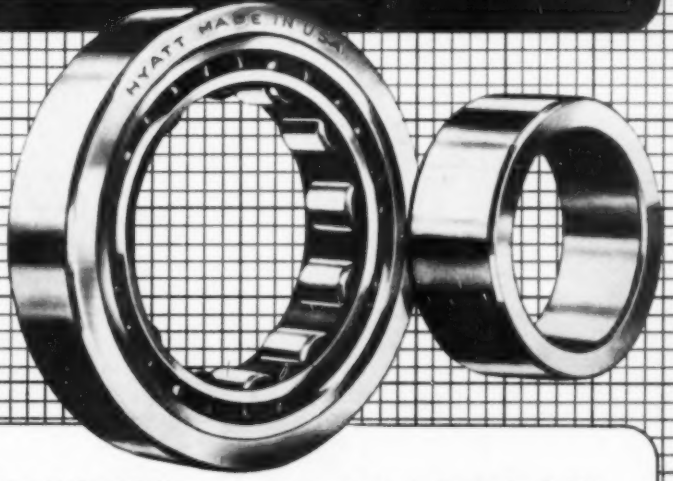
YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

HYATT HY-LOADS . . . for Capacity Separability and Long Life





IN THE family of Hyatt Hy-Load Roller Bearings is the popular A-TS type, one of the separable inner race, high-capacity cylindrical roller bearings made in two diameter series, wide and narrow widths, to standard boundary dimensions.

Separable parts are freely interchangeable. Any inner race will fit any roller assembly of the same piece number, permitting non-selective fitting after preassembling the two bearing parts in separable machine elements.

Interference fit of the inner race makes it virtually an integral part of the shaft. No accessory device is required to hold it.

A straight cylindrical inner race permits lateral expansion of the shaft through the bearing in applications where this is an important consideration.

May be applied with the rollers operating directly upon the shaft to utilize larger shaft diameter or bearing of smaller size, thereby gaining greater shaft rigidity.

For full information about the "A-TS" and other Hyatt Hy-Load Roller Bearings, write for Hyatt Catalog 547. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS

NEVER TOO TOUGH

In forty-nine years of manufacturing gears we've learned that solving the knotty problems put to us by some of our customers is well worth the time and trouble involved. For, in addition to satisfied customers, it provides us with available answers to the same problems whenever they arise again.

Then, too, it gives our customers ever greater confidence in our ability to master their many gear requirements.

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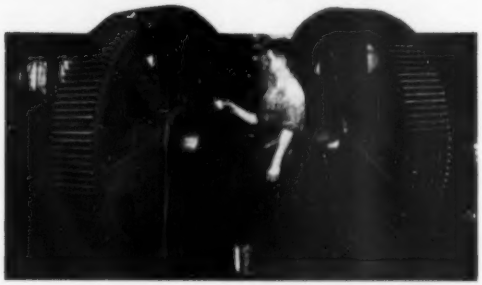
EARLE GEARS

It's good business to do business with EARLE!

HEAVY DUTY GEARS *for Tough Jobs*



Ready for shipment, the H-arm spur gears shown above will see grueling service in mine hoists. Superbly constructed by Stahl craftsmen using the finest in precision equipment, as are all Stahl products, they will prove more than equal to the demands of the job. If it's gears you need, it will pay you to get Stahl's estimate first.

SPURS TO 72" PD, 1 DP
BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP
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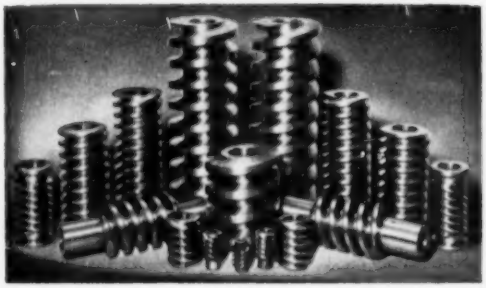
SILENT GEARS: RAWHIDE, BAKELITE, FABROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS – OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio



ADAMS custom made gears

While your product is still on the boards, plan on using Adams precision-made gears. Built by craftsmen . . . exactly as specified.

the ADAMS line . . .

SPUR GEARS	INTERNAL GEARS (Spur and Helical)	SHAVED TOOTH GEARS (Spur and Helical)
BEVEL AND MITER GEARS	RATCHETS	
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The ADAMS Company
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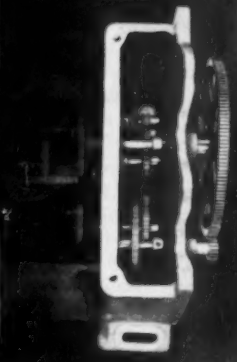
ESTABLISHED 1883

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS

GEARS
IN QUANTITY PRODUCTION



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We specialize in quantity gear production for manufacturers. A complete plant with over 100 machines in continuous production.

ACME GEAR COMPANY
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NEW heat-treating
No guesswork in Brad Foote's modern, completely new heat-treating department. Note control panels with recording instruments.

Heat-Treating of gears is a science. It can bring out the ultimate of service life offered by quality alloys. Good heat-treating is dependent upon knowledge of heat-treating processes and skill in using fine heat-treating equipment.

- Illustrated above is part of BRAD FOOTE'S new $500,000 heat-treating department with modern equipment that removes the element of chance from a sometimes fallible job. Precise control equipment assures exact temperatures and timing—which means unvarying conformity to hardness specifications.
- The best in heat-treating at BRAD FOOTE is but another step in our complete control of the quality of every BRAD FOOTE gear, gearmotor, reducer, and transmission. It is your guarantee that you'll get satisfactory service if you use the gears yourself or build them into your equipment for use by others. No one shares our responsibility.
- We'd like to discuss your gear requirements.

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4 TONS PRESSURE 285 TIMES PER MINUTE

BENCHMASTER

OPEN BACK INCLINABLE **PUNCH PRESSES**

ACCEPTED AS STANDARD THE WORLD OVER

Features:

4 TON BENCHMASTER

Die Space: Ram to Bed (Ram up, adjustment up) 8"
Bolster Plate . . . . . 6" x 8" (2" center hole)
Standard Strokes . 1" or 1¼"
Special Strokes to Order . . . . . 1½" or 2"
Strokes per Minute . . . 285

Brake and automatic knock-out included. BENCHMASTER AUTOMATIC FRICTION ROLL FEED available as an extra.

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Benchmaster punch presses are universally accepted as standard in the industry for all *light tonnage, high speed operations.* The model illustrated delivers more than 4 strokes per second, hits with 4 tons of punching force at every stroke! In addition to the 4 ton Benchmaster, smaller and larger Benchmasters are available: 1 ton (plus), 7½ ton and 4 ton deep throat.

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For punching, stamping, forming, riveting, trimming, piercing, marking, shearing and countless other operations *you can do it faster and cheaper on a Benchmaster!* WRITE FOR FREE CIRCULAR SHOWING ALL MODELS AND SPECIFICATIONS.

benchmaster
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In the field —

a new kind of lubricant

Moly-sulfide is a tenacious solid-film lubricant with remarkable properties under extreme pressure, high velocity and fretting conditions. Many new uses for ***Moly-sulfide*** are being found every day in the shop and the field.

We have compiled 154 case-histories of successful applications of molybdenum sulfide to solve a wide range of industrial and technical problems; these are published in a form most useful to those who want practical information on what has already been accomplished by this new kind of lubricant.

Send for your free copy of ***Moly-sulfide***: *In The Shop—In The Field*, a 40-page booklet of up-to-date information.

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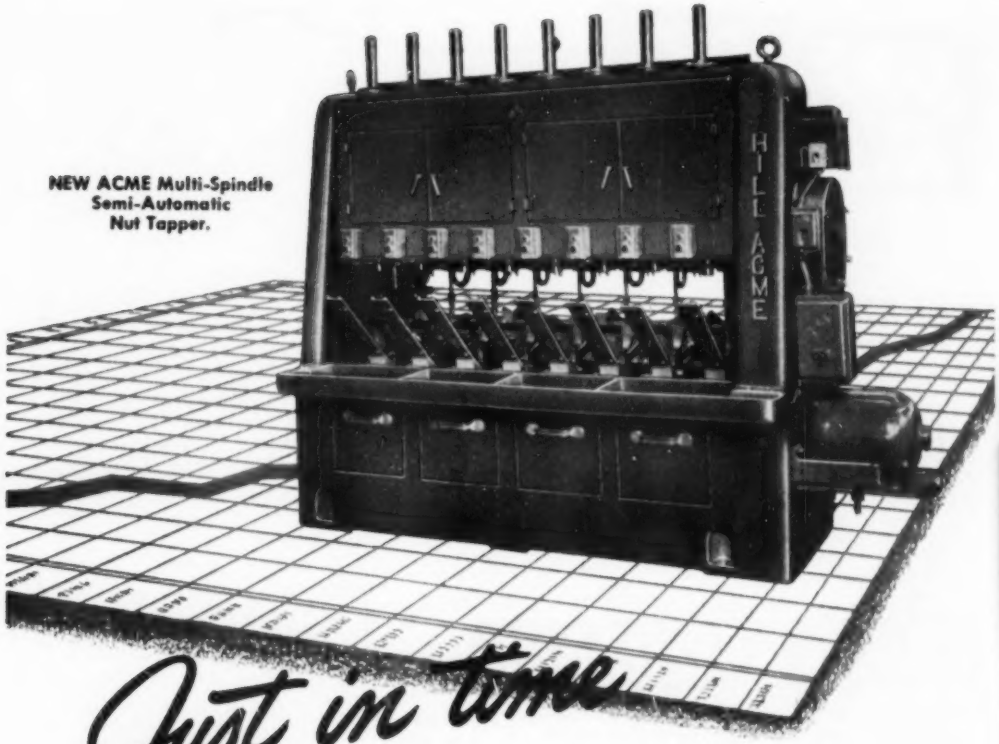

NEW ACME Multi-Spindle Semi-Automatic Nut Tapper.

Just in time

TO HELP YOU INCREASE PRODUCTION

Redesigned just in time to meet the needs of increased production in your plant, this ACME Model XWT eight spindle nut tapper will not only step up production but because of semi-automatic operation, will greatly reduce operator fatigue. Built in 6 and 8 spindle models in 1" and 2" capacities. The same machine can also be adapted for tapping couplings. Delivery schedules are reasonable.

FEATURES

1 Conveniently located push buttons operate the spindles.
2 Hydraulically controlled spindle cycle.
3 Repeat cycle is automatic.
4 Adjustments for change of cycle are quick and easy.
5 Change gears running in oil bath easily replaced for different spindle speeds.
6 Silent operation.
7 Worm drive in spindles.
8 Anti-friction bearings.

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ESTABLISHED 1882

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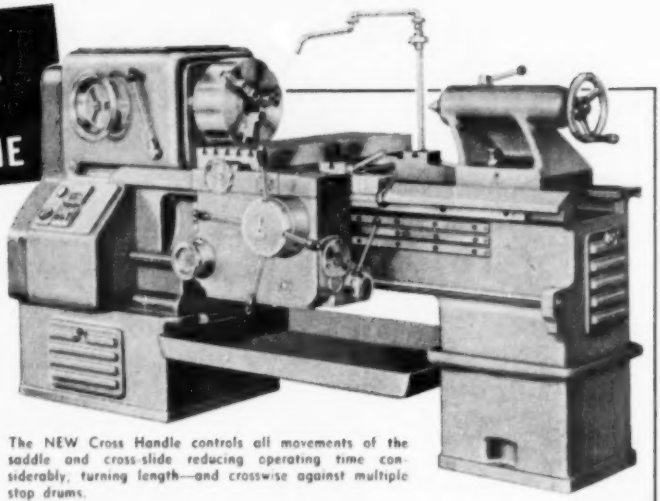
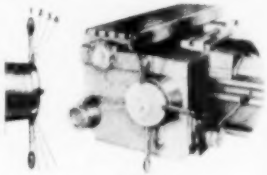


Versatile Use in Production as
MULTI-TOOL LATHE
COPYING LATHE
SINGLE-PURPOSE MACHINE
TURRET-LATHE TYPE
MULTIPLE-OPERATION MACHINE



1—Automatic Cross Feed
2—Hand Cross Feed
3—Hand Longitudinal Feed
4—Automatic Longitudinal Feed

The NEW Cross Handle controls all movements of the saddle and cross-slide reducing operating time considerably, turning length—and crosswise against multiple stop drums.

EXCELLENT DELIVERY
Send for detailed Data and Catalog

Swing over bed	21½"
Centre distances	29½", 39⅜", 59"
Spindle Speeds, R.P.M.	63-1000
Drive Motor, H.P.	9½
Net Weight, lbs.	4200

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KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

Everything You Want in a Good High Speed Saw at an Ever-So-Low Price

LW POWER HACK SAWS

ONLY $283.06

Stops automatically on completion of cut. Automatic relief of saw blade on non - cutting stroke. 6" x 6" capacity using 10" x 14" blades. 12" x 3" clutch pulley. Pulley speed 120 r.p.m. Coolant pump base. Swivel vise for angle cuts. All steel welded base and table. V-belt drive. Rigid frame. Gravity feed. Length gauge. Expanding cutch.

3-speed (90 to 130 r.p.m.) V-belt motor drive arrangement, $29.31, less motors. ½ H.P. 1725 r.p.m. motor recommended. Completely Motorized with Switch: Single Phase $375.74; Three Phase $382.53.

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Send for complete catalog giving prices and specifications on these quality low-cost L-W Products

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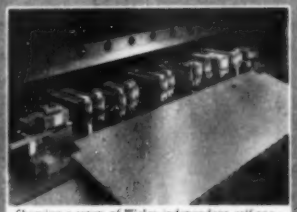
ENGINEERING AND PRODUCTION "KNOW HOW" HAS MADE

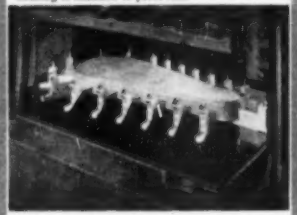
WALES

HOLE PUNCHING AND NOTCHING EQUIPMENT

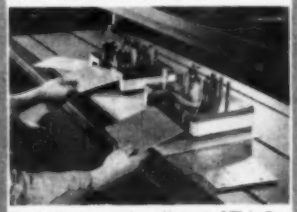
the most complete line



Showing a setup of Wales independent, self-contained Hole Punching and Notching Units with the finished flat sheet in the foreground. Note, nothing is attached to press ram.



Showing a setup of Wales Horizontal Type Units for punching holes in curved and straight flanges and rims with the curved flanged work nested in position ready to be punched around the entire rim. Note, these units are mounted on templates.



Showing two progressive, self-contained Wales Box-type Assemblies. With Wales Hole Punching Units, any good mechanic can make a hole punching die for press brakes or stamping presses.

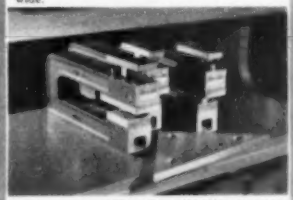
* Only creative ability can produce an original and complete line of new patented products. That, basically, is what has made Wales Equipment the leader in tooling for hole punching and notching.

Many metal fabricators have made it standard practice to call in Wales Service Engineers whenever tooling is being planned for hole punching and notching in angles, channels, extrusions and sheets. These fabricators have found it is more economical and time saving to call on Wales before designing and building special hole punching and notching dies because STANDARD Wales Units can be used at greater savings.

Take advantage of the years of Wales research, engineering and "know how" by writing TODAY for fully-illustrated, functionally colored catalogs of this complete line of Wales Equipment.

Wales Fabricator provides rapid interchangeability for punching and notching. Work from blueprints or operation sheets. No templets required.

Wales Drilling Machine with Boring Head is specially designed to meet the exacting requirements of locating, drilling, reaming and boring holes in material of practically any length and up to 56" wide.



Showing a setup of Wales Type "HS" Hole Punching Units for punching mild steel up to 3/4" thick. This high capacity unit is typical of the versatility and wide range of uses of Wales Hole Punching and Notching Equipment.

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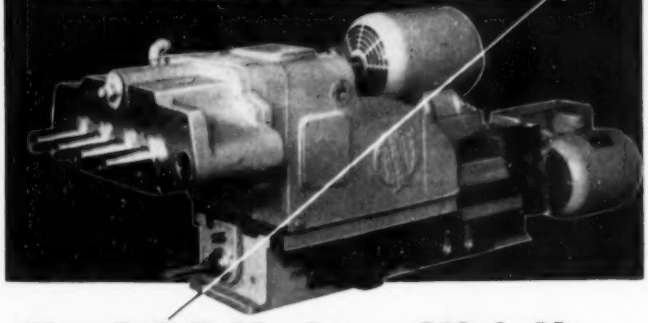
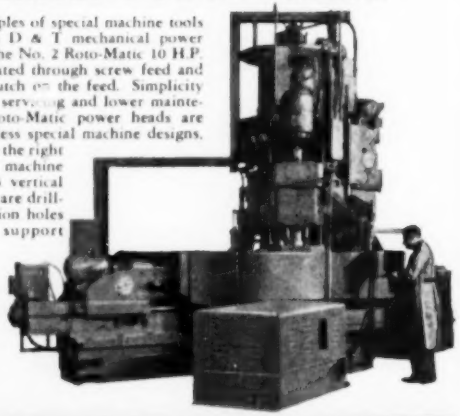


Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 5 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



Free Data

is available on the complete line of D & T machines. Ask for Bulletin 1000.

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Microstructure determines tool life . . .

U. S. AIR FORCE MACHINABILITY REPORT 1951

This *American Machinist* Special Report summarizes recently released data from the $100,000 machinability - research project conducted by Curtiss-Wright and other companies for the United States Air Force.

You will find particularly valuable, as a key to estimating the tool life cutting speed of any steel, this report's comprehensive chart of 12 steel structures under four metallurgical conditions.

Copies of this 8-page Special Report, which includes information on machinability as influenced by heat-treating and alloying, are available at 15 cents each.

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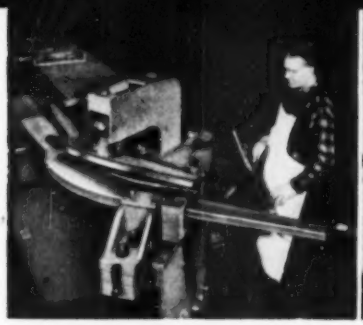
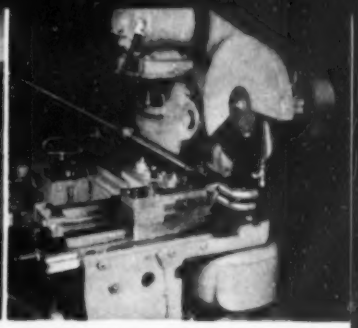


HEAVY, TAPERED HOLLOW SECTION — Pieces fabricated from 2 tapered welded strips of 12 gauge steel stock are given a 34" radius bend and a 41° edge bend on a Pines Size 4 Bender.

STEEL RODS — Multiple groove die on Pines Size 3 Automatic Bender forms ten 7/16" x 67-1/4" steel rods simultaneously to a 22" radius for farm implements.



COPPER ELLS — 3/4" ells are formed to 7/8" c/l radius and cut off automatically two at a time from 20 ft. stock lengths on a Pines Size 3/4 Bender.

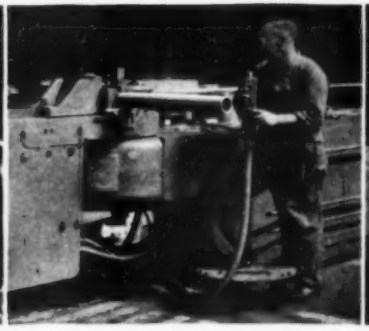
For NEW IDEAS in METAL FORMING

SQUARE TUBING—An eight foot length of SAE 4130 steel tubing 3" square, 1/4" wall, is compound bent to close tolerances. Segment mandrel maintains smoothness of the 10" inside radius bend.

investigate PRODUCTION BENDING the "PINES-WAY"

When you have a production problem of cold forming parts from round, square, rectangular, extruded or hollow stock to an even radius, or to different angles, chances are you will find the job can be handled more profitably on a Pines Automatic Bender. The examples shown here are only a few of the many different applications, in addition to ordinary tube bending, that are today handled efficiently on Pines machines. Production-wise and cost-wise, you will find bending the "Pines-Way" is a more accurate and profitable metal forming process. Investigate production bending today. Call on Pines engineers for assistance without obligation.

SQUARE STEEL BARS — Compound bends at each end and large center-radius helix are cold formed on a Pines Size 2 machine. Tooling costs reduced 75%, half of the production operations eliminated.



4" I.P.S. EXTRA HEAVY PIPE — Cold forming in place of hot bending on this Size 4 Pines bender eliminated a costly pickling operation at Allis-Chalmers' West Allis plant.

EXTRUDED ALUMINUM — Part of a production line set-up in a large aluminum fabricating plant, this small Pines Semi-Automatic bends an intricate extruded moulding for automobile window frames.

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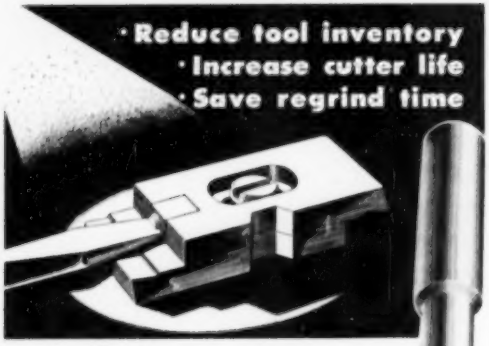

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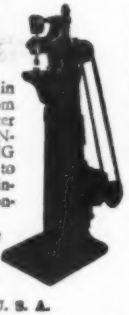

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This die was not just "made"...

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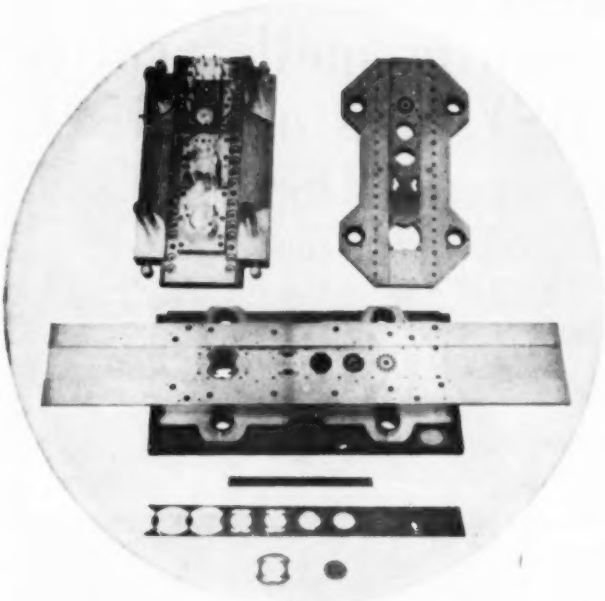

Just a choice of words, you say? No, it's more than that. The progressive steel lamination die shown here was hole-bored, hole-ground and contour-ground to pre-engineered dimensions entirely on Moore-built machines in the Moore toolroom. It exemplifies the application of *engineering* principles that put die-making on an interchangeable parts-and-assembly basis for the first time.

Let's take a close look at this die: All die sections are mounted in a hardened nickel-chrome frame for maximum production and die life; the die set was specially made by Moore. The spring stripper is guided on four main posts. High-speed inserts are set into hardened steel frames.

Moore produced all parts of the die *to figures instead of to "fit."* This was done concurrently by several toolmakers instead of progressively as a slow, one-man job.

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No. 2 MOORE JIG BORER

Punches and dies of the first station—at the right in the photograph—were ground with a *Moore Panto-Crush Wheel Dresser*. This machine, which combines roll-crushing and diamond dressing, did the required linear contour grinding quickly and efficiently. *Moore Motorized Centers* handled several of the smaller grinding jobs.

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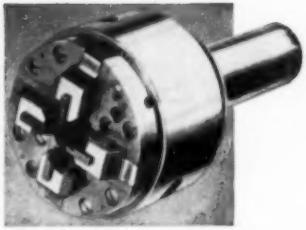

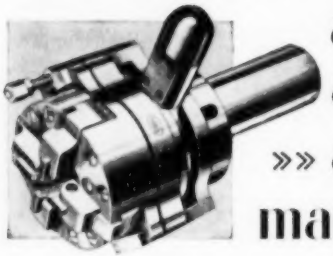

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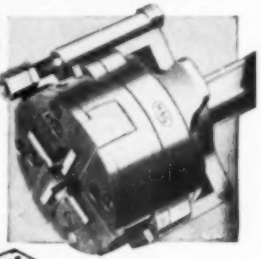

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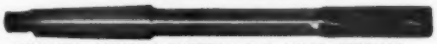

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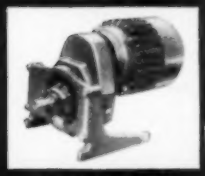
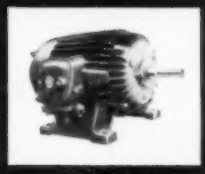


Geared Motor, "SADI"



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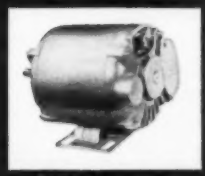

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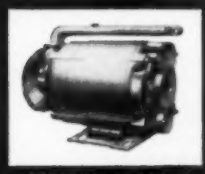

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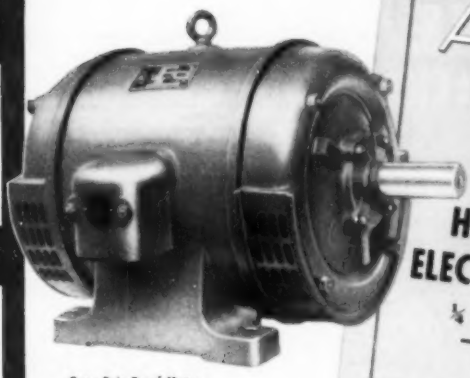

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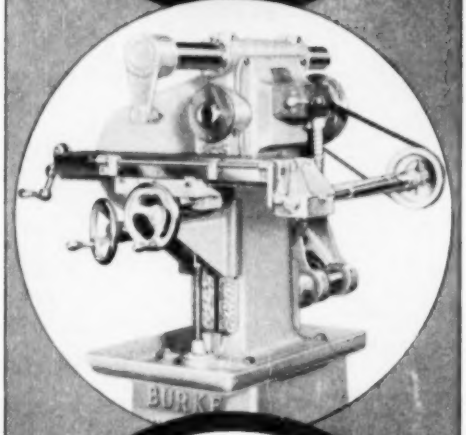

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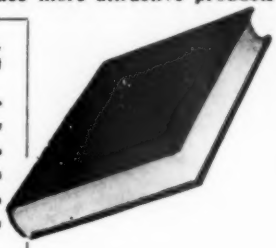

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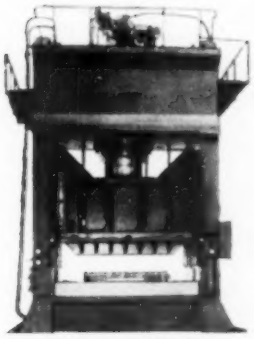
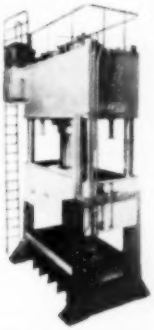
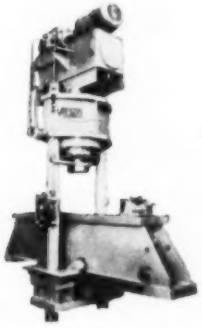


1200 ton straight side

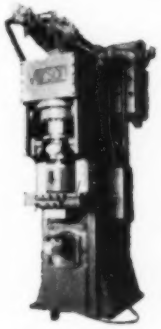


750 ton post type

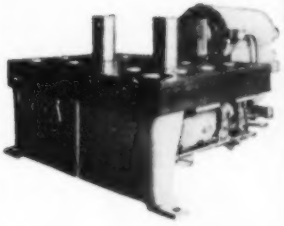
400 ton double action



400 ton straightening press



300 ton horn press



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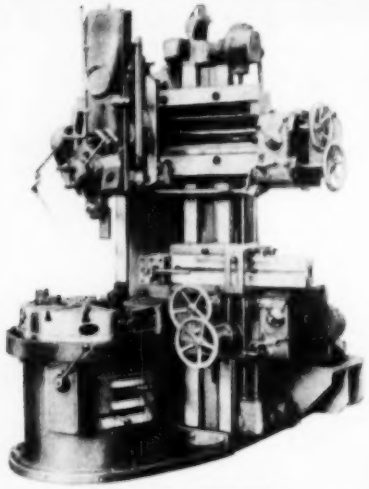

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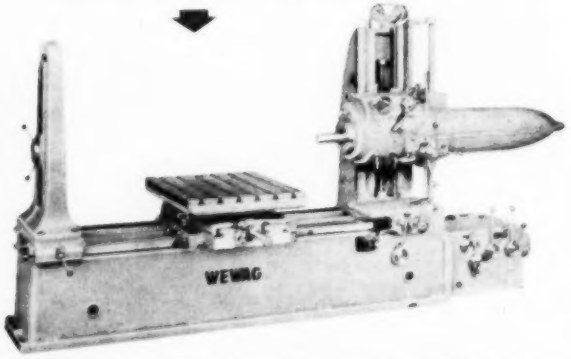

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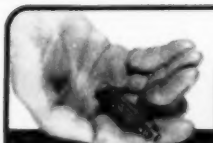

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The sailor fainted and fell down, yet the old man clung ever closer. He rained blows on Sinbad, driving him about without rest, to pick fruit and do his pleasure. This went on and on, until the desperate sailor made wine from wild grapes to appease his own plight. One day noting Sinbad's pleasure, the old man snatched a gourd of wine and gulped it down. Completely drunk, he loosened his grip and Sinbad threw him off. Saved by a passing ship, his rescuers said, "You are the first ever to escape strangling by the Old Man of the Sea".

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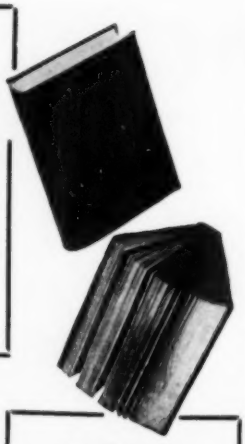

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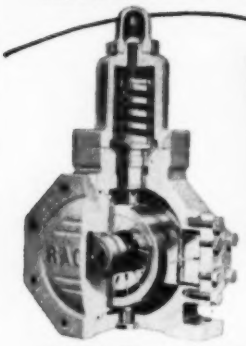

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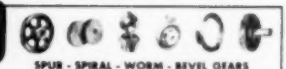

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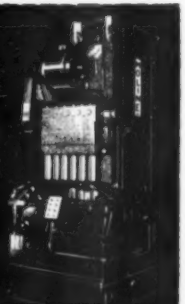

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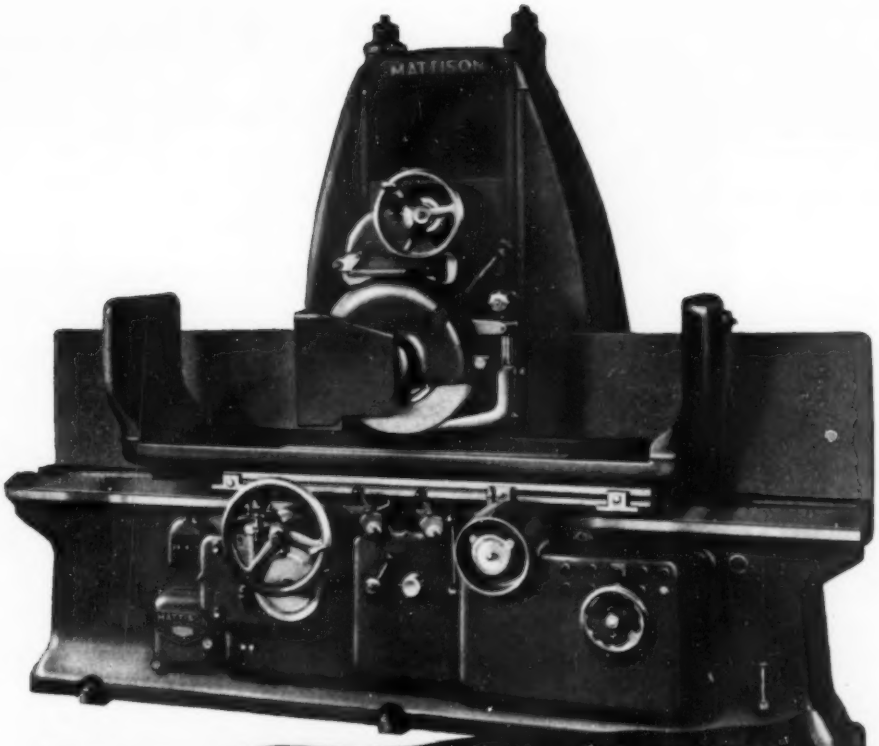

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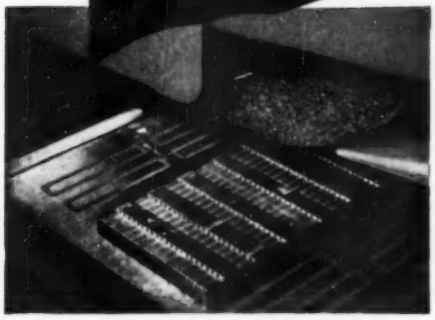

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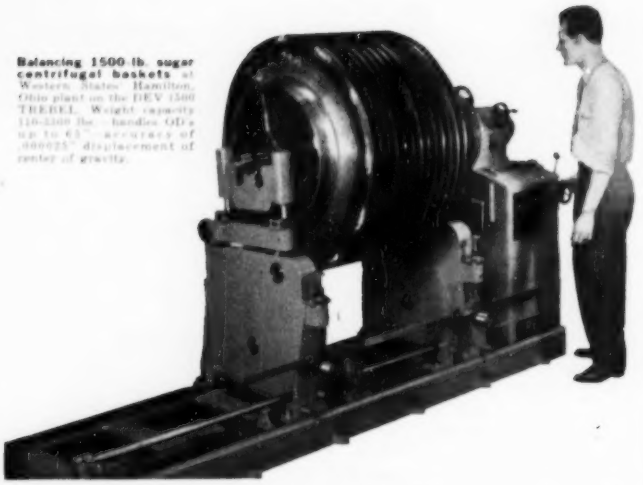

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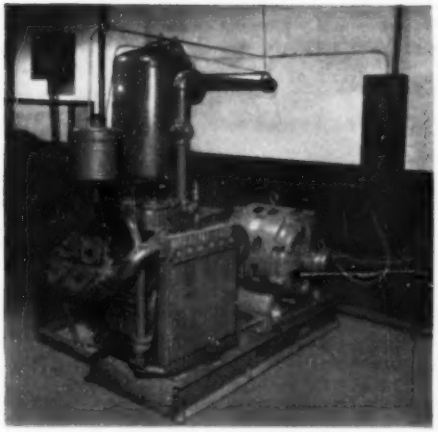

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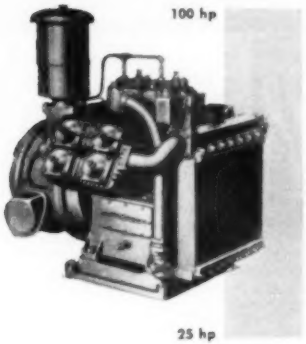

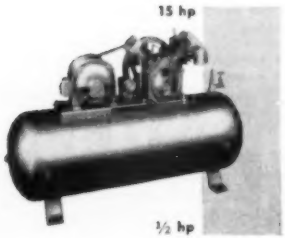

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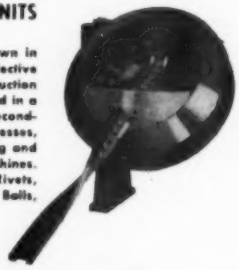
Picks them up and lays them down in exactly the right position—A selective feeding device whereby production parts are selected, oriented and fed in a given position for primary and secondary operations. Adaptable to Presses, Centerless Grinders, Thread Rolling and Slotting Machines and Special Machines. Feeds Screws, Screw Blanks, Rivets, Pins, Nuts, Discs, Washers, Steel Balls, etc.



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IMMUNOL is also outstanding as an additive to soluble oils for additional rust protection, and the same solution that is used for cleaning parts is also effectively used for washing workers' hands and arms.

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FLUID MOTOR by GEROTOR

- Has low rotational inertia, permitting easy control of shaft speed and direction.
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Gerotor fluid motors are available in two models, six sizes, rated up to 8.7 h.p. Maximum operating pressure is 1200 p.s.i. continuous, 1500 p.s.i. intermittent. Plain, base or flange mounting, for direct coupling, belt, chain or gear drive.

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At Clinton Specialty Works normal production of a high precision part was 100 pieces per hour when holes were drilled, with about 250 per drill grind.

When Pivot Straightground Whipsleeve Punches replaced drilling operations, production zipped up to a minimum of 1,000 pieces per hour . . . with an average punch life of 10-15,000 piece and occasional runs of 40,000 pieces . . . at the former cost of burring drilled holes.

R. A. KENGOTT *President of Clinton Specialty Works, 2645 North Paulina, Chicago 14, Ill., whose company attests that "we are of the opinion that with a standardization on Pivot straightground whipsleeve punches any company could give better delivery service and parts by punching instead of drilling holes".*

Part illustrated is used in military communications equipment: stainless steel type 18-8, .045 thick, Rockwell "c" 30-35, with an .041 diameter burr-free hole. Over 1,000,000 of these were produced by Clinton to the customers satisfaction.

● Whether your perforation problem is simple or complex, standardization on Pivot Punches is your answer to increased production at decreased costs . . . maximum punch life and minimum "down time".

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. . . are thoroughly discussed

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Proper application of clad materials can cut costs and save scarce metal. Output of clad materials has more than doubled since 1946 . . . has climbed to more than 23,000 tons per year and may reach 1,000,000 tons by 1960. Clad materials offer advantages that may well have profit-wise applications in your business.

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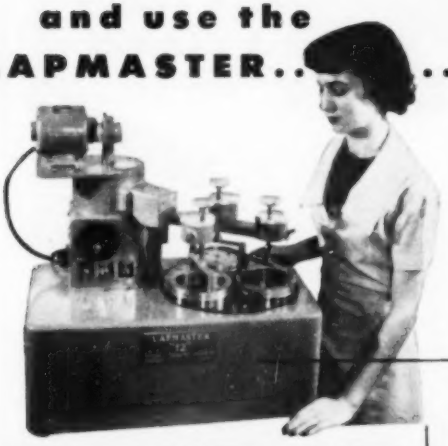
INVESTIGATE!

and use the LAPMASTER...



Above, parts lapped at high production on Lapmaster. Left, Model 12 Lapmaster in operation. Other machines available in complete range of sizes.

Use this FREE Laboratory Service to determine Your Exact Needs...

In order to determine whether lapping would be practical and profitable for you, we maintain a laboratory for lapping sample parts. If you believe it may offer possibilities in your plant we invite you to send prints of the parts, together with surface finish requirements and production desired. In addition send several parts for test lapping in our laboratories. We can then give you the facts on what you can expect from the Lapmaster. There is no obligation for this service.

ADDITIONAL DATA...

on the complete line of Lapmasters is available on request. Write for your copy today. Ask for bulletin A.M. 12.

If You Want PRECISION FLATNESS, FINISH and PARALLELITY in PRODUCTION QUANTITIES

A manufacturer of hardened high carbon steel valves required parts lapped to a degree of flatness for withstanding 2000 P. S. I. air pressure with no leakage. The part shown above is $\frac{3}{8}$" in diameter and $\frac{1}{16}$" thick. It is precision lapped on each side with the Lapmaster 12" at the rate of 195 pieces per 5 minute lapping cycle per side.

Prior to his investigation of the Lapmaster, the manufacturer had not been able to find a satisfactory method of lapping these valve parts. He reported that he would have been unable to make this valve to its existing design without the Lapmaster. The economies of production it afforded made it possible for him to produce the valve at a marketable cost.

Consistent Flatness of 1 Light Band Opens Possibilities for Product Improvement

Manufacturers of pumps, compressors, and equipment containing liquids or air under high pressures have found it possible to eliminate gaskets in mating surfaces because of the extreme accuracy of work produced by the Lapmaster. Quality of surface (RMS) is controlled by Lapmaster compounds. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can also be held to less than one light band or .0000116". (11.6 millionths of an inch.)

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CRANE PACKING COMPANY 1836 CUYLER AVENUE CHICAGO 13, ILLINOIS

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Extra CLEARANCE
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Two sets of multiple blades duplicated simultaneously from single master blade on Gorton 9-J.

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If your present production schedule doesn't warrant twin-spindle operations, install a conventional Gorton Duplicator now. Whenever you feel the need, you can easily change to the twin-spindle head and ram assembly—cost of conversion only 22% of complete single-spindle machine. This doubles the ability of your duplicator to turn out work.

Whether you need a conventional or twin-spindle duplicator, Gorton's general catalog contains important information for you. Write for it today.

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Machine: Gorton Super-Speed 9-J Duplicator with twin-spindle head assembly and rotary tables used for indexing work pieces for each of 20 positions.

Cutters: Two high-speed steel, 4-flute, spiral cutters with square noses, ⅜" dia., turned at 980 rpm for both roughing and finishing.

Time for Cutting: 4½ hours.

BONUS — one extra work piece finished completely, and identical to the other, from one simple master of one blade.

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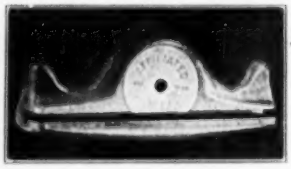
THE INDISPENSABLE TOOL FOR EVERY PLANT **SAFEED** Patented



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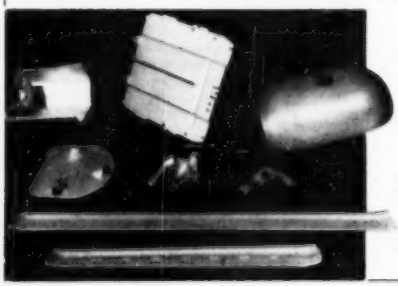

● Shown is a representative group of stamped parts produced with dies designed and built by Schnell. It includes parts of various shapes and sizes to illustrate the flexibility of the Schnell organization in developing high production dies for low cost operation.

For example, the tank cap (top right) was produced most economically due to ingenious die design. Five operations were performed on one machine progressively in such a way that a piece was completed on every hit of the press. Production averaged 1200 pieces per 8 hour shift on an operating cycle of only 15 seconds per piece.

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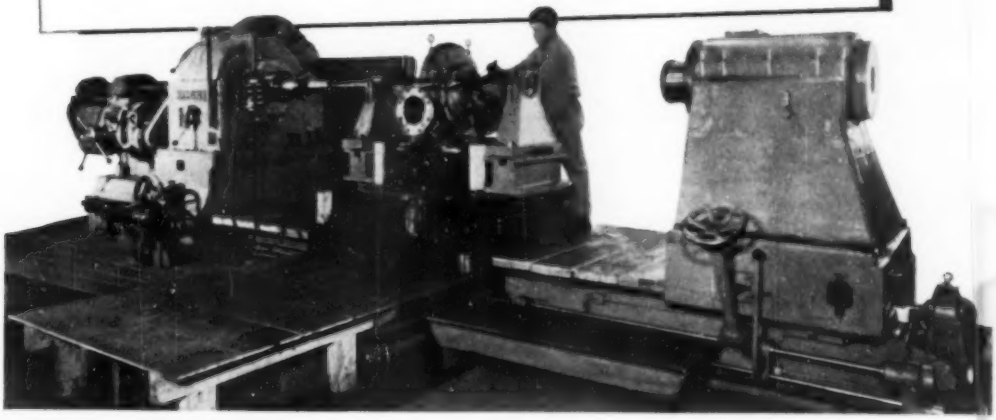
Machining Time on Pump Casings Cut 45% at De Laval Steam Turbine Co.



FOR DEEP BORING:

The Simmons 6" Boring and Facing Machine

When installed in De Laval's boring department, the Simmons 6-in. Bar Horizontal Boring and Facing Machine proved itself in no time.

In boring and facing single-stage pump casings, it cut previous average machining time by 45%. And in machining worm gear cases, machining time was cut by 50%.

"The Simmons machine has all the horsepower we need," says De Laval's foreman of the boring department. "In fact, it has the horsepower, the speeds and feeds we need for carbide tooling. And that's why we've been able to boost our output so substantially."

* * * *

There's really no such thing as *the* Simmons 6-in. Boring and Facing Machine. It's actually many machines—all based on the same unit-type construction, but each adapted to the special needs of different manufacturers. It can be adapted to your needs, too, no matter what your deep-boring job. Write for details.

Check these features

1. Automatic, continuous facing head permits high-speed facing with carbide tools.
2. Hydraulic feed to entire head in addition to normal bar feed.
3. Boring head fed to and from work reduces overhang of boring bar to a minimum—resulting in greater accuracy.
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7. Standard bar length is 17 ft.; travel in one setting is 72 in. Bed lengths and widths supplied to your needs.
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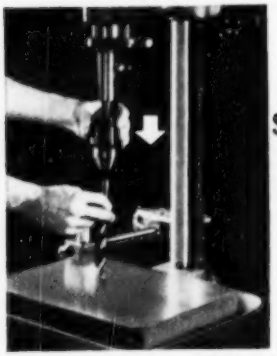
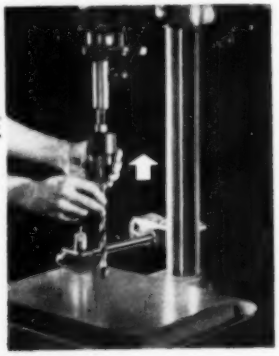
no keys . . . collets . . . or wrenches



SPINDLE NEVER STOPS



HERE'S ALL THERE IS TO CHANGING TOOLS

TO OPEN – Grip Sleeve – pull down – jaws open automatically – tool is released.

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SAVE TIME—Change tools with spindle running . . . no keys, collets or wrenches needed. Ideal for fast, uninterrupted production.

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WAHLSTROM CHUCKS AND TAPPING ATTACHMENTS FULLY-AUTOMATIC

From the *American Machinist* Library of Tips for Top Shop Men

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REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

Over-age Machines Cost You Money!

Over 42 per cent of metalworking production equipment was over 10 years of age in 1949 . . . 19 per cent was bought more than 20 years ago. These machines have had an average of a quarter century of use, including five years of wartime overwork and mistreatment.

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Here are all the facts on the age and number of 155 major types of production equipment operating in 15 metalworking divisions and 25 major production areas. Cost is $2.00 per copy.

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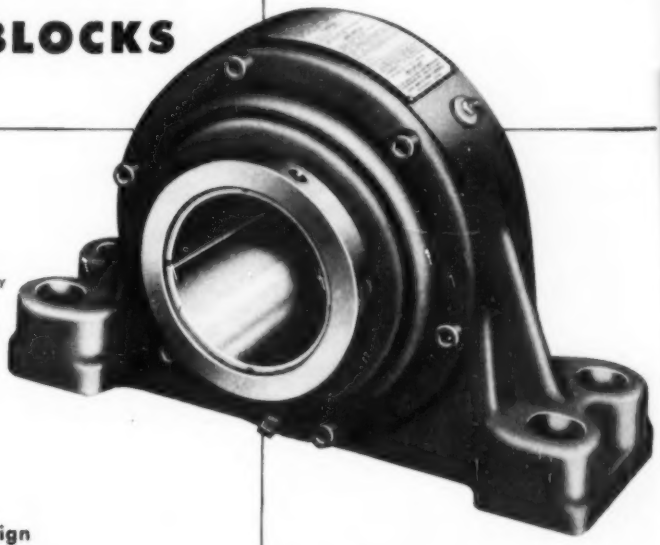

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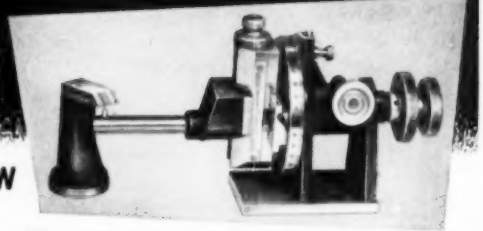

Now you can have precision within "tenths" and set up in *one-fourth* the time. Tangi-Matic has a direct-reading micrometer *built in*, eliminating "mikes", height gages, Jo Blocks and errors. Even novice operators obtain extreme accuracy. Tangi-Matic dresses any concave radius down to .032", full 180° with equipment we give you. Set-ups can now be made without removing dresser from your grinder chuck.

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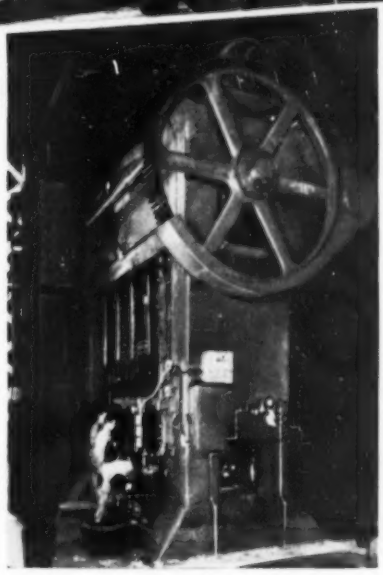

how FALLS STAMPING makes

5 times 12 equal 180

Five men handling 12 stations, turn out 180 vital parts per hour at The Falls Stamping and Welding Co., Cuyahoga Falls, Ohio. According to John J. Lange, Falls Stamping executive, "We purchased this new 900 ton Cleveland double crank press to speed production for the defense program. We chose a Cleveland, for this, our largest press, because we have had such satisfactory service from our previous 7 Clevelands. Installed in April of this year, this press has been in operation steadily . . . has exceeded our performance expectations. In that period there has been no noticeable die-wear. The Cleveland Drum Type Friction Clutch and Brake has given us the control and speed necessary to obtain excellent production and yet safeguard the operators."

For outstanding press production make your next press a Cleveland! Let an experienced Cleveland engineer recommend the exact Cleveland best suited to your requirements. Write or call today!

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Established 1880

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Eliminate Work Transfers! Cut Set-up Time In Half!

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- Table feeds, 5/16" to 20" per minute plus rapid traverse in all directions.
- 16 spindle speeds, 40 to 2000 r.p.m.
- Boring feeds, infinitely variable, from .0005" to .010"

More production—faster—with less labor and lower cost! This accurate, versatile and rugged solid-base No. 50 is now doing the work of 2 or more machines in hundreds of busy plants!

The No. 50 incorporates every essential feature for handling an extremely wide range of difficult boring and vertical milling jobs with production-line speed and toolroom precision. Time-wasting work transfers are completely eliminated—set-up time is reduced to half or less!

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ATTACH TO COMPANY LETTERHEAD

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Send details on No. 50 and other Knight milling machines.

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TITLE .....

☐ Send information on Knight 20" and 42" Power Feed Rotary Tables.

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Americans Are Rolling Up Their Sleeves!

YES, ALL KINDS OF PEOPLE ARE GIVING BLOOD SO THAT OUR WOUNDED MAY LIVE!

● Today, the blood of a Boston bookkeeper may be flowing through the veins of a wounded kid from a Kansas farm . . . the blood of a pretty Southern housewife may have saved the life of a grizzled leatherneck. For, blood is blood, a God-given miracle for which there is no substitute . . . and when a man's life hangs in the balance and blood is needed, there is nothing else to take its place!

Right now the need for blood is urgent. In hospitals —at home and overseas— many men require four and six transfusions during delicate operations. And the blood *must be there*—when it's needed. So give the most precious gift of all—*your* blood!

Be assured that giving blood is neither difficult nor distressing. And what a thrill there is in knowing that you've performed a really unselfish act! So call your local American Red Cross today and make an appointment. And tell your friends and neighbors about your experience. Let them share the wonderful feeling Americans get when they roll up their sleeves—and give blood.

But—

WHAT HAPPENED TO THAT PINT OF BLOOD YOU WERE GOING TO GIVE?

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FAST
— all hand feeds — no stops, gears, or automatic feeds to adjust or fuss with.

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— up to 15" long x 10" wide x 12" high.

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— built-in motor is integral part of grinding head.

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— hand feeds eliminate many moving parts.

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— ways and wheel slide hand scraped so spindle is square with ways within .0005".

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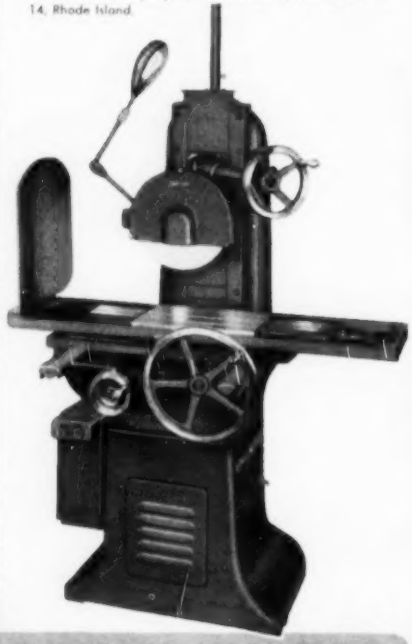
ACCURACY QUALITY PRODUCTION

Thousands in use throughout the world!

Why not give your toolmakers the Abrasive No. 1½ — favorite toolroom surface grinder in big and small shops throughout the world. Write for illustrated catalog. Abrasive Machine Tool Company, 8 Dunellen Road, East Providence 14, Rhode Island.



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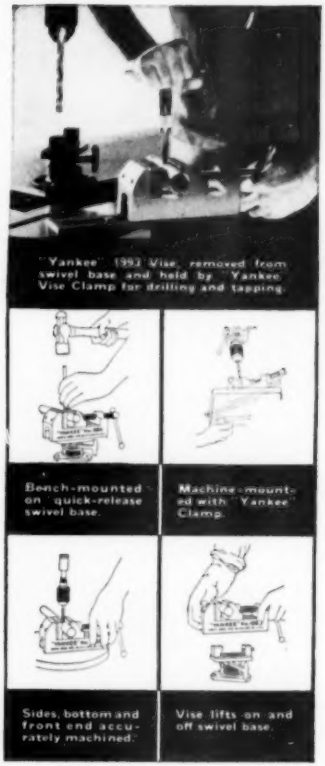
SPEED UP SMALL JOBS with "YANKEE" VISES


"Yankee" 1993 Vise, removed from swivel base and held by "Yankee" Vise Clamp for drilling and tapping.
Bench-mounted on quick-release swivel base.
Machine-mounted with "Yankee" Clamp.
Sides, bottom and front end accurately machined.
Vise lifts on and off swivel base.

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"Yankee" Tools now part of
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THE TOOL BOX OF THE WORLD

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PUT SMALL JOBS ON THIS LINLEY MACHINE
and save your larger machines for heavier work.

YOU'LL *BE SURPRISED!* at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7" x 17½" table size.

Write TODAY for Full Information

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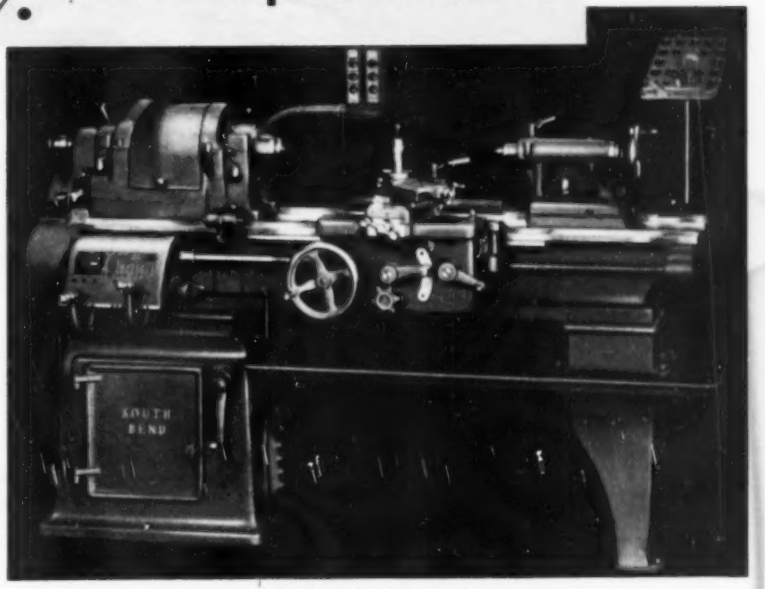
New! SOUTH BEND 16"-12 Speed Lathe

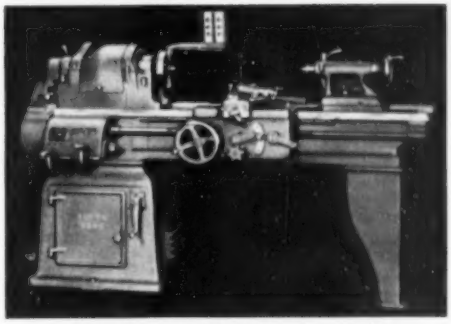


16" x 6'—12 Speed Toolroom Lathe

Specifications

Spindle Speeds 12
Direct drive
high range . . . 330, 550, 945
low range . . 150, 278, 475
Back gear drive
high range . . . 32, 70, 118
low range . . . 20, 33, 60
Swing over bed and saddle wings . . . . . 16¼"
Swing over saddle cross slide . . . . . 9⅝"
Center Distances . . . 33½", 45½", 57½", 81½", 105½"
Collet Capacity . . . . . 1"
Spindle Bore . . . . . 1⅜"
Longitudinal Feeds . . 48 R.H. or L.H. .0015 to .0841"
Cross Feeds . . . 48, .0006 to .0315"
Thread Cutting . . . 48 R. H. or L.H. pitches, 4 to 224 per inch.
Cross Slide travel . . . . 10½"
Compound Rest Top Slide angular hand feed . . . 3¾"

This new South Bend Twelve Speed Lathe will save time in the production shop, toolroom, maintenance department, or wherever an extra wide range of spindle speeds is needed. Equipped with pushbutton control which provides instantaneous changes between high and low speeds, multiple operations requiring frequent speed changes such as drilling and tapping, boring and reaming, or turning and facing can be performed with utmost efficiency. Send coupon for complete information.



16" x 6'—12 Speed Quick Change Gear Lathe

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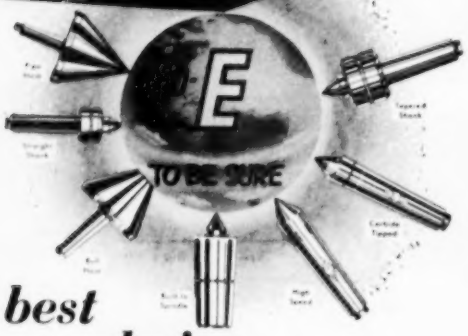

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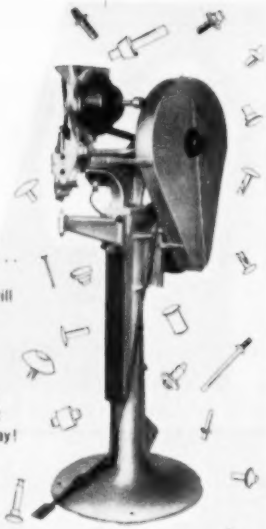

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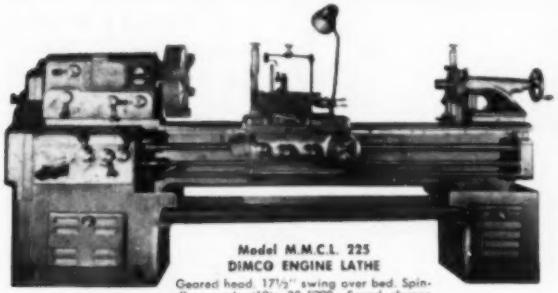


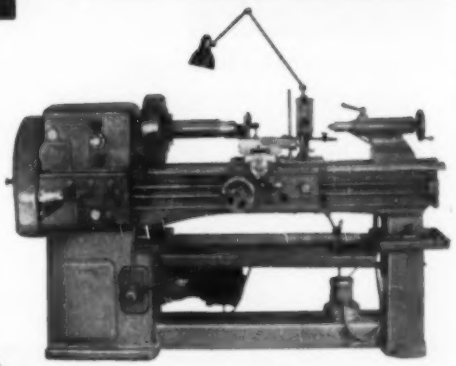
Model M.M.C.L. 225
DIMCO ENGINE LATHE

Geared head. 17½" swing over bed. Spindle speeds (12): 32-1000. Speed change gears slide on splined shafts. Hardened and ground gears.

Available also with hydraulic tracer attachment.

These powerful DIMCO machine tools are precision-built for continuous production. They're giving top service now in many plants throughout America.

Write us for our new catalog giving detailed information and specifications on these rugged machines, as well as the complete DIMCO line.



Model DBC 175
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Geared head. 13" swing over bed. Speed (standard model): 26-1004. High speed model: 52-2008. Speed change gears slide on splined shafts. Hardened and ground gears.

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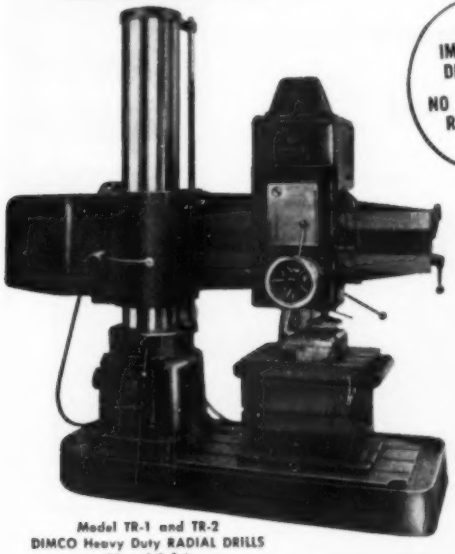

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your best buy in modern milling machines:

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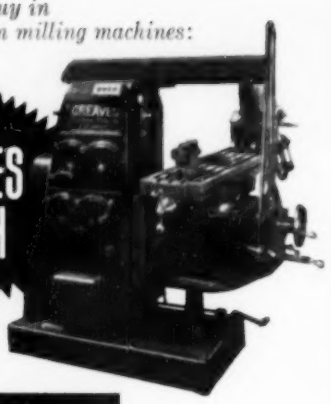

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- Offers every modern milling machine advantage:

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• A Boring Head that Won't Face is Not Complete

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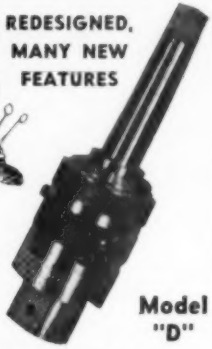

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Chandler-Duplex

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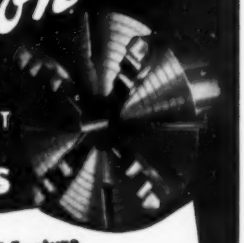
INDEPENDENT LATHE CHUCKS



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Gives Jaws "Steel Finger" Action

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Try it yourself. Pick up a piece of work in your fingers. That's ordinary holding. Now squeeze . . . that's Whiton Multi-Thrust "Steel Finger" action.

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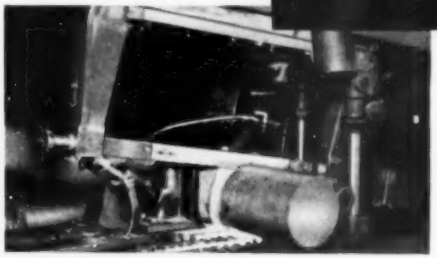

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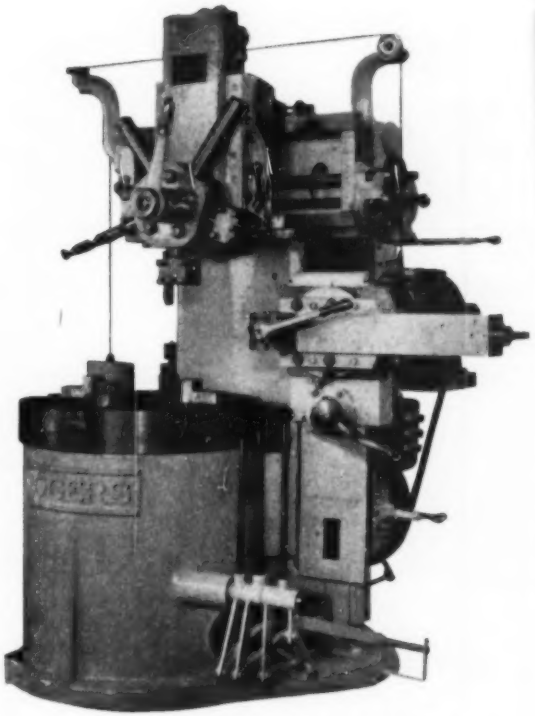

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Drill Grinder with ⅛ inch capacity holder on left and 2½ inch on right side. Can also be furnished with a general purpose grinding wheel on left end instead of the small drill holder. Also available for wet grinding.

A POINT TO REMEMBER

A drill point that is sharp and correctly ground will—

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(3) drill more holes per grind

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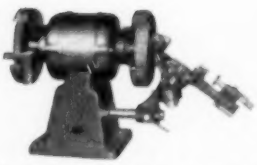
(5) reduce breakage

(6) cost less to regrind

(7) increase life of drill as less metal is removed each time drill is sharpened.



Bench type Drill Grinder with ⅛ inch capacity holder. Also made in 1¼ inch capacity Pedestal type.

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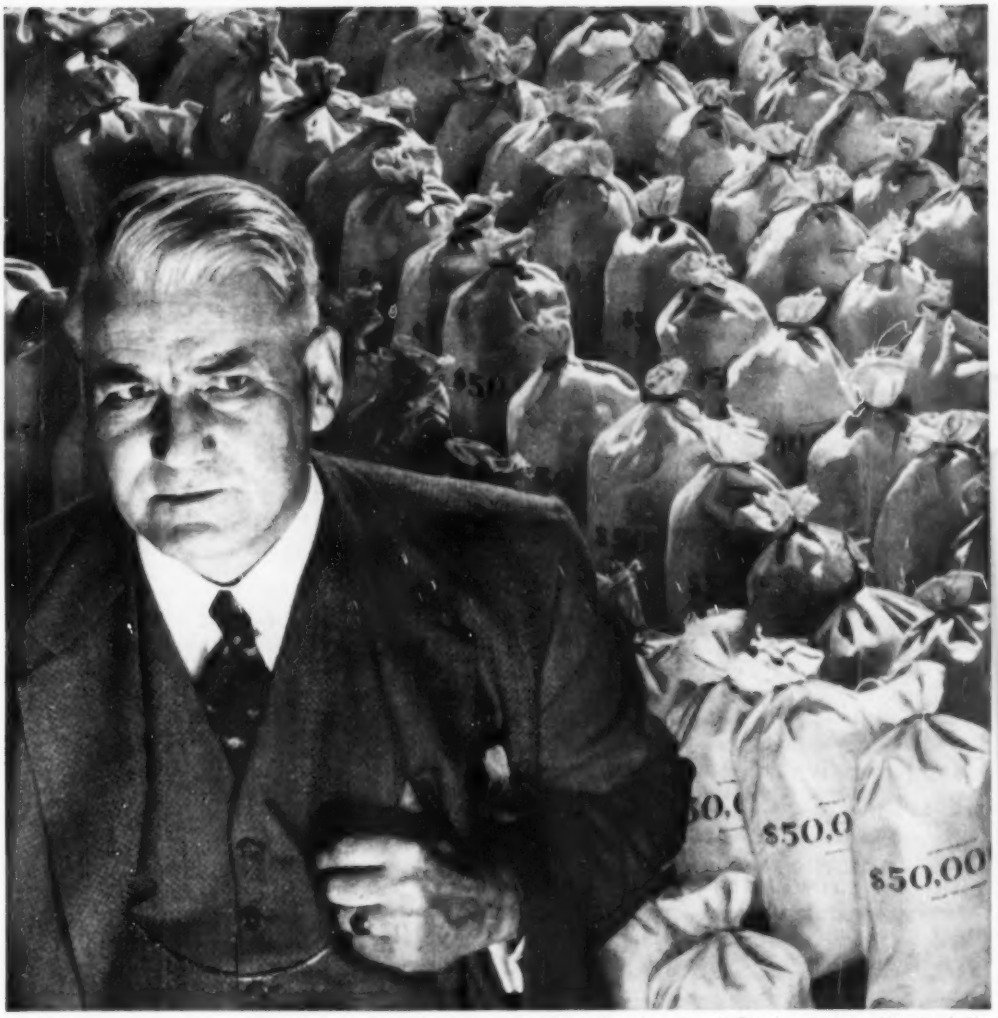

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Mechanical Engineers and Physicists needed by large machine tool company for expanding program of basic and applied research on metal cutting, and on the grinding of metals treated as a metal cutting process. Here is an opportunity for original research in a virtually virgin field with a company well known for its research contributions to this field. These positions offer unusual opportunity and challenge to individuals with a sincere interest in developing and applying new knowledge of a type that will benefit industry as a whole.

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Excellent opportunity with prominent Midwest manufacturer.

Must have sound engineering knowledge, preferably in hydraulics. Sales background helpful. Must be willing to travel.

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ASSISTANT TO president of large machinery manufacturer located in East with experience in manufacture of heavy machinery, shop administration, technical background and ability to embrace larger responsibilities. Full details please, which will be held in strict confidence, photo optional. P-6011, American Machinist.

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PLANT SUPT.: qualified to assume full responsibility as Plant Manager. Twenty-three years diversified machine shop experience in job shops manufacturing and erecting of heavy precision machinery, familiar with modern machine shop methods, ranging from blueprint stage, through processing, design tooling, estimating & labor relations. Present location Wisc., desires to relocate. PW-5771, American Machinist.

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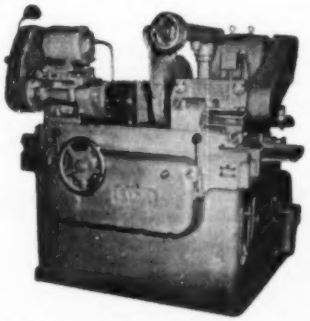
BORING MILL, 36"x44" Niles Vert. M.D., Side Head.
BORING MILL, 48" Bullard M.D., 2 Heads.
BORING MILL, 10" Cinci-Vert., M.D., 2 heads.
BORING MILL, 2½" Lucas Horiz., M.D.
BORING MILL, Lucas Horiz. 3" Bar, M.D.
BORING MILL, Giddings & L. 50 Horiz. 3½" Bar.
BARRELS, Tumbling Lapomatic, Schutte & Koerting.
BROACH, #3 Lapointe Horiz. 30" Str., M.D.

COMPRESSOR, Ingersoll Rand ER-1, 10 HP., M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New
COMPRESSOR, C-P 50 HP., M.D., 10x10, 278 CFM.
COM., Ing.-Rand ER-1, 100 HP Syn. M.D.
CRANE, DET Rieker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 1 ton cap.
CHIP WRINGER, Barrett #251, 12" D., 18" dia.
CHIP WRINGER, 20" Tailhurst W., Late.
GAS CUTTER, Airco #4 & #10 2 Radiograph.

RADIAL DRILL, 3'x9" Mueller, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 36" Walker Turner M.D., Late
DRILL, Fosdick 16", B.S. Power Feed, M.D.
DRILL, #2 Colburn M.D., #4 M.T., M.D.
DRILL, #121 Baker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2, M.D.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #2B, 3 spdle., #2 M.T., 16".
DRILL, 4 & 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, 4 Sp. Barnes M.D., #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Natco Multiple Spdle., #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNETIZER, SB-911 Magnaflux, late type.

FACING HEADS, 20" & 24" Hummert-Dixon.
FILER, #11-B Cochrane Bly Auto Saw Filer.
FILER, #11-S Type P4, Floor Type, M.D. Theil
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #5543.

GRINDER, #1 Wilmarth Norman Hand Surf., 6"x12"
GRINDER, #2 Imperial Univ. Tool & Cutter, New
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc Besly #285, 12" Spdle. End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60"
GRINDER, #13 B. & S. Univ. Tool & Cutter, late.
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Ulrov Auto, M.D. Orrtispeistor
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4½".



LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

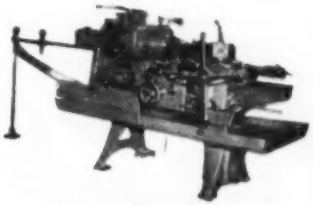
GRINDER, #2 Norton Univ. Cutter & Tool, late.
GRINDER, Norton 8x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 32" Wheel Dia. Osterheim Disc, 24" cap.
GRINDER, M.G. Sanford Surf. 8"x12" cap., New.
GRINDER, 10" Ingersoll Tub Face Mill, M.D.
GRINDER #70-72" Gardner Vert. Spindle, Late.
PROFILE GRINDER, Studer Type PSM, M.D., late.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

HAMMER, Rochester Hispeed, all sizes, M.D.
HAMMER, Bradley 2000 Rubber Cushioned Mshs.
HEADER, Manville #1 S.S.S.D. Cold 3-16".
INDUCTION HEATER, 10 KVA Ecco Hi Frequency
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW
HOIST, 5 ton capacity, Shepard Electric.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

DISC GRINDERS

Osterheim 37" Wheel Diameter Disc Grinder, 40 HP. TEFC 3/60/440 spindle motor drive. 24" capacity.



#4 WARNER & SWASEY Geared Head Turret Lathe, Motor Driven, Bar Feed, Taper Attachment.

LATHE, Le-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, Hendey 12"x5' Q.C.G. Taper Attach. M.D.
LATHE, LeBlond 14"x6', Q.C.G. M.D.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, Lodge & Shipley 16"x8', Q.C.G., Grd. Hd.
LATHE, American 16"x8' Q.C.G., Grd. Hd., M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18-28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Hendey 20"x10' Q.C.G., Taper Att. M.D.
LATHE, Reed-Prentice 20"x10' Q.C.G., Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x12' Boyd & Emmes Gd. Hd., T.A., Late.
LATHE, Putnam 24-12"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, McCabe 26-48"x18' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, Bulling Dble. End #VMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simonds Vari-Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1½",
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci, Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork.

MILL, #4 Burke Motor Driven, Late, M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #4B Brown & Sharpe M.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-S Cinci, Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-S, Auto. Prod.
MILL, #0 Vernon Hand Mill, M.D. Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.

No. 700 ESPEN LUCAS Hydraulic Heavy Duty Cut-off Saw, new 1945.

MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical Hi Power, M.D.
MILL, #3C Becker Vert. Die Sinker, M.D.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.

NIBBLER, Gray Turret Type ¼"x24" cap. M.D.
THREADING, Staybolt Lassiter Milltheland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, Sx14 Pratt & Whitney No. 1105.
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Pfau-O Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 30"x20" Bed Area, M.D.
POWER PRESS—Bliss-Consolicated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS #5 Johnson OBI, 56 tons, new
PRESS, #7A Thomas O.B.I. 80 ton cap.
PRESS, #163 Toledo Toggle Drawing, M.D.
PRESS, 135 ton Clearing Single Crank 8" Str., Late.
PRESS, 70H Drake Hyd. Arbor, New.
PRESS, #70½, Bliss S.S. 9½ Str. M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 60C Bliss Double Action, 5 crank.
WHEEL PRESS, 300 ton Hyd. Press, 48"x10", M.D.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #60 Whitney Deep Throat, 24", Late.
PRESS, P2, P3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sqle. End, 24" Thr. 1" thru 1".
PUNCH, H & J #5 Sqle. end, 48" Thr. 2" thru 1½".

RIVET SETTER, ⅝" cap. Pans. Tubular Rivet.
ROLLS, Bertsch Pyramid 16"x1½" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.

COLD SAW, Wagner 18"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 60° dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #8 Marvel Band 18"x18" cap., M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, Band, Tannewitz GH-36" High Speed, M.D.
SAW, V-25 DoAll Contour Band, Late.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci, M.D., Motor driven, M.D.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
SHEAR, #642 Niagara 42"x¼" cap., 15° rap., M.D.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 90° Throat, 10 ga.
SHEAR, #8E Niagara M.D., 8'x¼ 15° cap. M.D.
SCREW SLOTTER, #2 Waterbury Farrel Auto. M.D.
SCREW SLOTTER, #117 Kent, M.D., Late.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 56 ton, 2½ cap. M.D.
SURFACE PLATES & TABLES, all sizes.

TAPPER #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
BRINELL, Tester Machine, Type UK300W, Steel City.
BRINELL, Tester Machine, Type 6IDR, Steel City.

WELDER, 500 amp. Westinghouse Flexers A.C.
WELDER, 200 & 400 amps. Gen. Elec., Portable Arc.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

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18" 44" N.B.P. Vert. Turret
24" Bullard M.D. Vert. Turret
Gidding and Lewis 007 Horiz. Table Type 1948 vintage. Boring Mill—Table 18"x26"—Dia. of Spindle 3½" Spindle Speed 2000 R.P.M.
Cinn. 10" massive type M.D. Vertical Boring Mill—2 Swivel Heads
Betts 8' (actual swing 108") 2 Swivel Heads Vert. Boring Mill, M.D.

GRINDERS

Heald Nos. 70A, 72A3 and 73 Int.
Blanchard 16A Vert. Surface
Cinn. #2, 3, and 4 Centerless
Norton 10"x36", 10"x50" and 14"x 96" Pl. Cyl. M.D.

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B & S #00G, 0G and 2G—Late
Conomatics 1⅞"—8 Spindle Auto.
2¼" 6 Spindle Natl. Acme Gridley Model "R"

PRESSES

Lempco 50 Ton "Hypermatic" M.D. High Speed Punch Press
50 Ton Henry and Wright M.D. Dieing
Reliance 45 Ton M.D. High Speed—Hydraulic O.B.I.
Toledo No. 666 Knuckle Joint 1000 Ton Coining
Bliss No. 1, 1½ and 3½B Double Action Toggle
Clearing Model D5—1500—60—300 Ton Double Action Press—194 Machine—Bed 54"x62"—Ram Travel 26".

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16"x21' Bridgeford G.H., Q.C.G. Engine
52"x17' American M.D. Geared Head High duty Heavy Pattern.
Hendey Lathes of all sizes

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and Save up to ⅔ in Cost Compared to New Machine Tools

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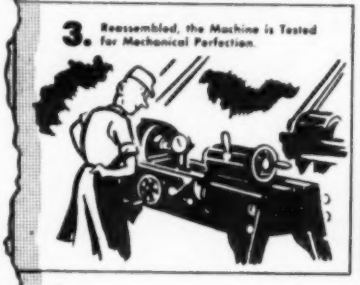

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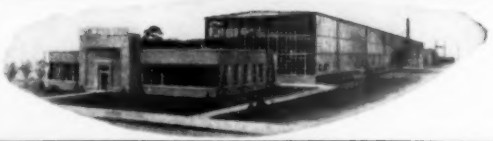

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NEW and LATEST TYPE REBUILT MACHINE TOOLS FOR SALE or LEASE

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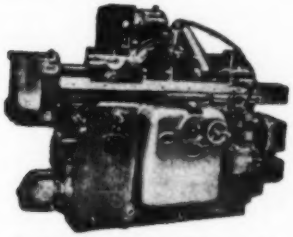
MONARCH Model EE 10"x20" Toolroom
MONARCH Model N G.H. Engine Lathe 33½"x120" cc
LODGE & SHIPLEY G.H. Engine Lathe 24"-27"x16' cc
AMERICAN G.H. Engine Lathe 24"-27"x20' cc
AXELSON G.H. 24-Sp. Engine Lathe 18"x54" cc
LEHMANN G.H. 16-Sp. Engine Lathe 18"-20"x82" cc
AMERICAN G.H. Engine Lathe 10"-10½"x30" cc
MONARCH Model ST Multi-Tool Mfg. Lathe 12"x18" cc
HARDINGE 2nd Operation Lathe 1" Cap.



JONES & LAMSON MODEL TG 12 x 48" AUTOMATIC THREAD GRINDER

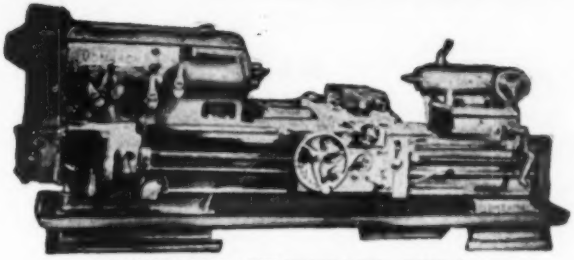
TURRET LATHES

WARNER & SWASEY Mod. 2 G.H. Ram Type 1" Cap.
WARNER & SWASEY Mod 2 G.H. Ram Type 1¼" Cap.
BARDONS & OLIVER Mod 2 G.H. Ram Type 1" Cap.
BARDONS & OLIVER Mod 3 G.H. Ram Type 1½" Cap.
WARNER & SWASEY Mod 3 G.H. Ram Type 1⅝ Cap.
GISHOLT Mod 3 G.H. Ram Type 1½" Cap.
WARNER & SWASEY Mod 5 G.H. Ram Type 2⅝" Cap.
GISHOLT Mod 5 G.H. Ram Type 2⅝" Cap.
FOSTER Mod 18 Univ. G.H. Saddle Type 2-9 1/16" Cap.

GRINDERS

BROWN & SHARPE Model 2 Internal-External Universal Grinder 14"x30" Cap.
CINCINNATI Univ. Hydr. Cyl. Int.-Ext. Grinder 12"x 30" Cap.
ROTOREX Model 101-A Universal T & C Grinder, w/Int. Att.
COVEL Model 91A Univ. T & C Grinder
JONES & LAMSON Model TG-12x48" Auto. Thread Grinder
EXCELLO Model 35 Thread Grinder
EXCELLO Model 51 Thread Grinder

CINCINNATI 12" x 36" HYDRAULIC UNIVERSAL GRINDING MACHINE INT. EXT.



MONARCH 33½" x 120" ENGINE LATHE—MODEL N

LAPPING MACHINES

ULTRALAP Model 18 Vert. Lapper

TAPPING MACHINES

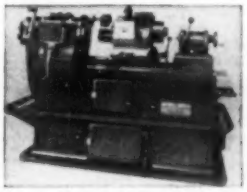
BAKEWELL Model 2 Tapper ¾"—3½" Cap.

MILLING MACHINES (Horizontal)

VAN NORMAN Model 36 Ram Type Duplex
NEW CENTEC Model 2A Universal With Vert. Att.
MILWAUKEE No. 1-B Universal Miller
BROWN & SHARPE Mod 18 Auto. Production Miller
CINCINNATI Mod 00 Plain Horiz. Auto., Cycle

MILLING MACHINES (Thread)

PRATT & WHITNEY Model C-M-1884 Thread Miller 4½"x36"
HANSON & WHITNEY Univ. Semi-Auto. Thread Miller 18"x48"



HANSON & WHITNEY UNIVERSAL SEMI-AUTOMATIC THREAD MILLING MACHINE 18" x 48"

MISCELLANEOUS

FAMCO #8, 8, 10, 12, 15 Foot Presses (NEW)
EXCELSIOR #8, 8, 10, 12, 15 Foot Presses (NEW)
ARBOR PRESSES (NEW)

VERTICAL MILLER

GORTON Model 6D Super Speed Vertical Miller

PRESSES

WIEDEMANN Model R11P 18 Ste. Power Turret Punch
RUESCH #2 Percussion Press
POWER PRESSES (New)

AUTOMATICS

BROWN & SHARPE Model 00G ⅝" Cap.
CLEVELAND Model A Single Spindle 9/16" Cap.
CLEVELAND Model A Single Spindle 1-1/16" Cap.
CLEVELAND Model A 1¼" Cap.
CLEVELAND Model B Single Spindle 1⅝"—1⅞" Cap.

BORE-MATICS

EXCELLO Model 2112A Single End Double Spindle Hyd. Cross Slide Table

DRILLS

NEW G. M. S. R. Type T.S. 2 Radial 4'x12" Column
NEW ZEWO Universal Floor Type Radial 21"x96"
NEW CANEDY OTTO 18" Single Spindle ⅝" Cap.
NEW FAMCO 18" Bench Type Drill Presses ½" Cap.
NEW FAMCO 18" Floor Type Drill Presses ½" Cap.
WORRIS MOR-SPEED RADIAL 3'x8" Column
LELAND GIFFORD 2 Spindle

GEAR EQUIPMENT

BARBER-COLMAN Type E Gear Hobber
FELLOWS 5" Fine Pitch Shaper
GLEASON 12" Straight Bevel Generator—Finisher—Roughter
GLEASON 3" Straight Bevel Generator
GLEASON 3" Spiral Bevel Gear Generator
GLEASON 3" Bevel Gear Tester
GLEASON Model G Angular Hypoid Tester
GLEASON 10" Spiral Bevel Generator
BARBER-COLMAN Model 12 Hobber 12" Cap.

PROFILERS

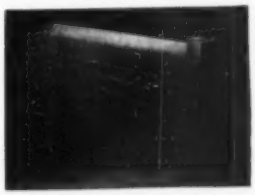
PRATT & WHITNEY 40-Inch Profiler 2 Side Heads
PRATT & WHITNEY 30" Single Spindle

SHAPERS

HENDEY Universal H.S. Crank Shaper 19"
GOULD & EBERHARDT Industrial Shaper 30"

SHEARS

COLUMBIA 90"x¼" Cap. 18° Gap Power Shear
PEXTO 44" Geared Power Gap Shear
NIAGARA Model 412 Power Shear 12'x16 Gauge



NIAGARA #412 POWER SQUARING SHEAR 12' x 16 GAUGE

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5/16" OOG Brown & Sharpe
1¼" Conomatic, 8 spindle
8", 6 spindle Bullard "A" Mult-Au-Matic
8", 6 spindle Baird Chucker, Model B
14" x 33" Fay
20" x 25" Fay
Gisholt Simplimatics

BORING MACHINERY

3" Rockford horizontal
4" Detrick & Harvey floor type
American vertical precision
72" Niles vertical

BROACHES

No. 1 Foote Burt duplex surface
2 ton Model HO American horizontal hyd.
10 ton No. 3XA Oil Gear horizontal hyd.
12 ton V2 American vertical hyd.
18 ton V42 American vertical hyd.

DRILLS

3' Cinti. Bickford radial
3½' American sens. radial
21" & 24" Cinti. Bick. upright
Nos. 217, 310, 321 & 36 HO Baker
No. 250 H Natco hydraulic
34 spdl. No. A16 Natco multiple

COMPLETE MACHINERY SERVICE

GRINDERS

No. 2 Cincinnati centerless
4"x12", Model H Landis
6" x 30" Cincinnati Filmatic cyl
10" x 18" Norton type C cyl.
21" No. 6-21-1 Besly opposed disc
22" No. 228 Hanchett opposed disc
23" No. 84 Gardner opposed disc
30" No. 84A Gardner opposed disc
53" No. 24 Gardner horizontal disc
No. 72 Heald Gagematic & Sizematic
12" & 16" No. 22 Heald rotary surface
No. 2 Brown & Sharpe universal
16"x48" Landis crankpin grinder
No. 42 Van Norman radius grinder
Nos. 5, 16A, 16-28 & 24-36 Bryant

MILLING MACHINES

No. 2 Cincinnati plain, motorized
No. 3 LeBlond plain, motorized
No. 3B Kearney & Trecker, SPD
.2" x 18" Cincinnati Mfg.
.8" & 24" Cincinnati automatic duplex
4-36 Cincinnati hydromatic bed type
Nos. 32 & 33 Kempsmith plain Mfg. mill
Ingersoll rise and fall
4" No. M80 Taylor & Fenn spline
8" x 16" Hanson Whitney thread
No. CT 36 Lees Bradner thread
48"x36" Ingersoll

MONEY BACK GUARANTEE

PLANERS, SHAPERS & SLOTTERS

10" x 10" x 10' Cincinnati, box table
16" x 36" x 8' American double housing
36" x 36" x 8' Cleveland OS, one rail, one side head
36" x 36" x 10' Niles, AC motor drive
26" Smith & Mills back geared shaper, motorized
26" Worcester heavy duty shaper
26" Morton draw cut shaper
32" Ohio "Dreadnaught" motor drive shaper
36" Niles traveling head shaper
10" Betts slotter
12" and 16" Bement slotter
24" Niles Bement Pond Slotter

MISCELLANEOUS

3½"-8" American sensitive radial drill
¼" McCabe pneumatic flanger
Nos. 5N & 6B Nazel pneumatic forging hammers
16A16 Bryant Grinder
No. 78 Wilmarth & Morman surface grinder
10" x 16' LeBlond Engine lathe
No. 5 Acme universal turret lathe, late
No. 5 Gisholt universal turret lathe, late
80 ton No. 50-D-36 Cleveland SS Dbl. Crank press, late
600 ton No. 2316½ Hamilton eccentric shaft coining and forging press
600 T No. 570 Toledo hi-speed forging press
10'x10 gauge George Ohl Sq. Shear
9/16" National Electric welder, thread roller

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BORING MILLS

Giddings & Lewis 250T Precision Type Horizontal Boring Mill—Table 10" x 28"—Cross travel of table 24"—Spindle speeds 30 to 2000 RPM—MD—1947 machine

Landis Model 55 Floor Type Horizontal—3½" bar—Vernier scales—Extra long spindle—Outboard support—MD

(NEW) Model AF Horizontal Floor Type—4", 5", 6", 7" and 8" bars—Plain or swivel heads—Outboard supports

Bullard 42" and 54" "Spiral Drive" Vertical—Side heads—4-jaw chuck tables—MD

Betts 8' Vertical—2 swivel heads—69" under cross rail—Actual swing 108"—MD

Cincinnati 10' Vertical—2 swivel heads—Massive type—MD

GRINDERS

Landis 14" x 72" Universal—3-motor drive—Late type

Heald #72A Universal Internal—Swing 26"—Max. dia. ground 11"—Sizing bracket—MD—1943 machine

Norton #2 Hydraulic Universal Tool & Cutter—MD workhead—combination attachment—Internal spindle—MD—1942 machine

Cincinnati #2 Centerless—Through feed work rest—Hydraulic wheel dresser—MD

MISCELLANEOUS

(2) Bardons & Oliver #7 Universal Turret Lathes—Preselector heads—Cap. 2½"—Bar feeds—Taper attch—Threading attch—MD—Late Type

Gray 36" x 36" x 8' Openside Planer—One rail & one side head—Helical gear drive—Table 32" x 96"—MD

Lumpco "Hypermatic" High Speed Press—Stroke 3"—Die space 18" x 18¼"—1000 strokes per minute—MD—Late Type

V & O #2½, 3½, 4 and 5 Open Back Inclinable Presses—All MD, some with Reeves drives and roll feeds—Late Type

(2) Henry & Wright 25 Ton Dieing Machines—Double roll feeds—Reeves drives—Littell coctering reels—MD—Late Type

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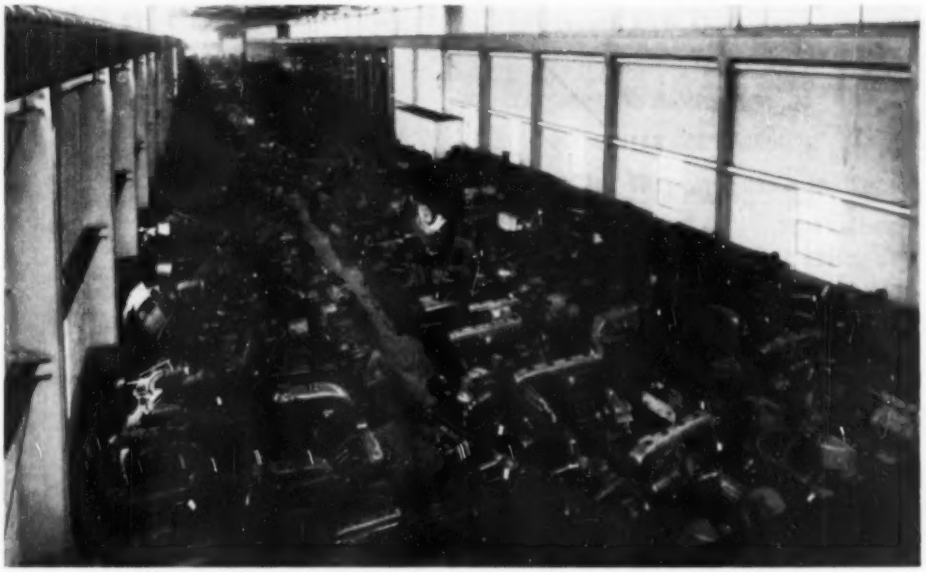

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UPRIGHT DRILLS

16" Excelsior, belted m.d.
21" Cincinnati, belted m.d.
24" Aurora, belted m.d.
24" to 36" Cincinnati Bickford, cone type, upright sliding head
26" Aurora, m.d., tapper
32" Aurora, belt drive
No. 2 Colburn Mfg. Type, belted m.d.
D6 Colburn, m.d., H.D.
No. 314 Baker, m.d.
No. 315 Baker, Heavy Duty, s.p.d.
No. 515 Baker, m.d.
32" Superior Drill
24 Defiance Machine Co. Drill, m.d.

GEAR SHAPERS

No. 12 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61 Fellows, belted m.d.
No. 61A Fellows, m.d., latest type
No. 64S Fellows, m.d.
No. 615A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, belt
No. 72 Fellows, m.d., latest
No. 75 Fellows, m.d.

GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical
No. 13LS Fellows Gear Lapper, m.d.
6G11 Gear Grinding Machine, m.d., latest

GEAR HOBBING MACHINES

No. 12 Barber-Colman, single overarm, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d., Spur & Spiral
Pfauter Gear Hobber, Model RS 1, m.d., new

GEAR CUTTERS

No. 50 Cross Gear Chamfering Machine, m.d.
Gleason Spiral Bevel Gear Rougher, m.d.
5" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.

GEAR TESTERS

Michigan Gear & Hob Checker, No. 471, late
No. 1 Brown & Sharpe Spur Gear Tester
12" cap. National Broach & Machine Co.
18" National Broach & Machine Co.

AUTOMOTIVE GRINDERS

Kwik-Way Model H Piston Turning & Grinding Machine, m.d., late
No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d., late

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 5/8" valve stems, m.d.

PLAIN CYLINDRICAL GRINDERS

6x18" Landis Plain Self-Contained, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x30" Cincinnati Hydraulic, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x16" Cincinnati Plain Self-Contained, m.d.
14x52" Norton, motorized
14x48" Cincinnati Plain Self-Contained, m.d.
16x72" Landis Plain, m.d.
No. 20—10x16" Brown & Sharpe, m.d., late
20x120" Landis Plain Self-Contained, m.d.

DISC GRINDERS

No. 2 Gardner, belted m.d.
No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
No. 20 Gardner Comb. Disc Grinder & Belt Sander, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
No. 24—53" Gardner, m.d.

EMERY GRINDERS

3 H.P. Baldor Pedestal Type, 32M
5 H.P. U.S. Elec. Tool Co. Model 95
2316 Monmart & Dixon Radial Emery Grinder, m.d., 5 H.P. motor
Hammond Model 4 Carbide Grinder

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK AUTOMATICS, HORIZONTAL AND VERTICAL BORING MILLS, BROACHES, RADIAL DRILLS, ENGINE LATHES, MANUFACTURING LATHES, MILLING MACHINES, PRESSES, PLANERS, RAILROAD MACHINERY, SAWS, SHAPERS, TURRET LATHES, ETC.

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- SHAPERS
- MISCELLANEOUS

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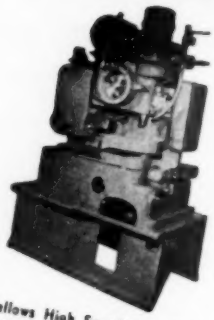

Type 27 Fellows High Speed Gear Shaper suitable for both spur and helical internal and external gears.

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AUTOMATIC SCREW MACHINES
No. RA-6 9/16" Acme Gridley, 1942
No. RA-4 1¼" Acme Gridley, 1943
2" Model A Cleveland, 1942
1-1/16" Model "A" Cleveland, 1943
No. 00G Brown & Sharpe, 1942

BROACHES
HP—100 La Pointe Hyd. Horizontal, 1945
5 ton 36" BC, La Pointe Horizontal, 1942

GEAR EQUIPMENT
No. 7 Gleason "Revex" Roughor, 1945
No. 6 Gleason Revacycle Generator, 1949
No. 72 Fellows H.S. Gear Shaper, 1942
10" Pratt & Whitney Hyd. Gear Grinder, 1942
Red Ring Universal Gear Checker, 1942
20M Fellows Red Liner Gear Tester, 1942

GRINDERS, CYLINDRICAL
16"x72" Norton Plain Type "C", 1941
16-/20x36" Norton Plain Type "C", 1942
14"x168" Norton Plain Type "C", 1942
12"x60" Fitchburg Plain Hyd, 1942
12"x48" Cincinnati Universal, 1942
10"x18" Landis Plain Type "C", 1940

GRINDERS, INTERNAL
No. 72A3 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943
No. 18 CP 18 Bryant Hydraulic, 1942
No. 18-10 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic Gap, 1940

GRINDERS, RADIUS
No. 73 Van Norman Radius Grinder, 1942

GUN BARREL MACHINES
No. ½ B x 30 Pratt & Whitney Rifler, 1942
No. ½ B x 30 Pratt & Whitney Reamer, 1942
No. ½ B x 30 Pratt & Whitney Reamer, 1942

LATHES, ENGINES
16"x298" American Geared Head, M.D.
30, 40x150 Sa'ep Gap Lathe, New

27"x192" Niles "Timesaver" Lathe, 1941
27"x210" Lodge & Shipley Gap Lathe, 1940
26"x180" Betts Bridgeford Lathe, 1940
26"x96" Betts Bridgeford Lathe, 1940
25-45x120 Oldfield-Schofield Gap, New

LATHES, PRODUCTION
No. 5D Potter & Johnston Automatic, 1943
No. 4D Potter & Johnston Automatic, 1943
0"x84" La-Swing Semi-Auto, 1941
Lipe-Carbo-Matic, Lathe, 1942

LATHES, TURRET
No. 1L Gisholt Universal Saddle Type, 1942
No. 1R Gisholt Universal Saddle Type, 1940
No. H5 Libby Universal Saddle Type, 1939
No. 5W Acme Universal Way Type, 1942
No. 5 Gisholt Universal Ram Type, 1942
No. 3 Gisholt Universal Ram Type, 1942
No. 4R Libby Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942
No. 3R Libby Universal Ram Type, 1942

MILLS
No. 3 Van Norman Plain, 1942
No. 1224 Milwaukee Simplex, 1943
No. 1-18 Cincinnati Auto, 1941
No. M-18 Milwaukee Auto, 1943
No. 2 Alsera Plain Mill, New
No. 2 Baimp Universal Mill, New
No. 2 Baimp Vertical Mill, New

MISCELLANEOUS
2000 HP Midwest Dynamometer, 1942
75 HP Gardner Denver Air Compressor, 1945

PLANERS AND SHAPERS
14" Brook Plain Shaper, New
18" Brook Plain Shaper, New
16" Garnetti Universal Shaper, New
20" Garnetti Universal Shaper, New
24" Garnetti Universal Shaper, PRT, New

PRESSES
650 Ton Verson Double Action Eccentric, 1940

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MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle, M.D.

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BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

GRAY 36"x36"x8' Planer, 2 heads on cross rail, motor driven. Thoroughly rebuilt and guaranteed.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL, B & S #11, 7"x32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

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BORING MILLS

Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Capacity
Giddings & Lewis #32, 3" #25, 2½" Cap.
King 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mills

DRILLS AND RADIALS

Brand New Radials
American 6'x15" Universal
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, No. 16 4 Spindle
Buffalo: Power No. 41, No. 42
Canedy-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col.
Natco #12 20 spindle drill
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" capacity
Leland Gifford 2 LMS, 3 MS

NEW VERTICAL MILL

ENGRAVERS

Deckel type 3 Dimensional, New
Gorton 35 Die Sinker & Engraving
Gorton, 3U
Gorton #1A, ME Deckel G1
Preis—UE3—2 dimensional
Taylor-Hobson 3 dimensional Pantograph

GEAR EQUIPMENT

Barber-Colman Mod. SHS. Sharpener
Barber-Colman #2, #12 (3)
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gleason No. 3 Bevel Generator
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

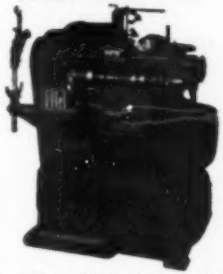
GRINDERS, MISCELLANEOUS

B&S #2 Universal 14"x28"
Brown & Sharpe #5 3"x18" Cyl.
Bryant #5, Internal, chucking, 16A16
Cincinnati 6x18" Hyd. #4—Centerless
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ.
Norton No. 2, Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6T Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shapers, 7", 8", 14", 18" Shaperite—Shears, Foot 22" to 8', 16 & 18 ga.—Shears Power 3'x18 gauge to 10' x 10 ga.—Welders Arc Seam Spot all sizes Motors, Grinders, Buffers.

AUTOMATIC SCREW MACHINES



Brown & Sharpe (4) Model 2G, serial No's. 8500 & 11500 series, 1¼", 1½" capacity
Brown & Sharpe (10) Model 0G, serial No's. 9600 & 10700 series, ⅝" capacity.
Brown & Sharpe (6) Model 00G, serial No's. 14, 15, 1600 series, ⅜" capacity.
Ceco Screw Machine ⅜" capacity.
Cleveland, Model AA-11, Serial #36586
Cleveland, Model B, Serial #42618-843, 1-1/16" capacity.
Conomatic 4 Spindle, Serial 2309FF, 1½"
Conomatic 8 spindle, serial No. 3947VB 1⅛"
New Britain Gridley 61 6 Spindle, Serial No. 25410, 1⅛" capacity.

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hydraulic
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Reid 11x36 Motor in Base, 2A 6x18
Taft Pierce #1 Precision

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Hendey 12"x42" and 12x30", 1941, 16x66"
Hendey 14" Toke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Corbo 12"x18" (2)
Lodge & Shipley #3A, #3 Duomatics
Pratt & Whitney 16"x60—Late
New 16, 18, 20", 28" Immediate Del.
New Tool Makers 10x24", South Bend 9"
Reid Small Piece #9WSL
Rivett Model 918 Precision, Mod. 715
Sebastian 12"x4' G.H., Sheldon 12"
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14" Production
Brown & Sharpe #3B Plain, Late, 3A, 21, #2L
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens 1V, 1-8, 1-14, 1M
Kempsmith #1 PL, Vert. & Div. Hd.
Milwaukee 2K, 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ. Dividing Head

MILLS, VERTICAL

Brand New Vertical Mills
Cincinnati 4 Spindle Vert. Profile
Cincinnati 2 Spindle Hydromatic
Cincinnati #2—1-18 Plain Automatic
Cincinnati #3, #4 hi-power, 08 Vertical
Cleveland No. 1, table 8"x32"
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp

PRESSES

Bliss No. 1 Double Action Drawing Press
Bliss 645, 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss S-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 PM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herning, 15 Ton
Niagara A1½, O.B.I., Niagara No. 27
Toledo 92½c Double Crank 43x23" bed
Toledo 79 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #3

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7, Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed. Chuck
Gisholt Simplimatic, 18"x16½"
Gisholt 4R—9¼" hole in spindle
Libby 1HS with threading att.—3R, 4R
Jones & Lamson #5, Bar Feed
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, #4 Preselector (2)

MISCELLANEOUS

Band Saw: New, Kalamazoo
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Boring Bar: Underwood 4"
Broach: 3L LaPointe Hydro. Horiz. New Klink. 6 Ton, Horizontal, 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Hand Mill: Whitney
Hoist: 5 ton capacity 7½ HP motor
Honer: Micromatic H-4
Keyseater Davis, Baker
Oil Groover: WICACO
Planer: Niles-Bement-Pond 36x36'x10'
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13"
Shapers: 24" Rockford, 24 - 28" Gould & Eberhardt, Cinn. 20, 24"
Shears Power: Obi 10' 3/16", 10"x 16 gauge
Vertical Milling Att. New, Bridgefield
Tapper: Haskins—2CA, Bakewell #2
Welder 50 KVA Elster Air Operated, New Seam
Welder: Taylor-Winfield 50 KVA Hi-Wave

New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

HYDRAULIC EQUIPMENT

8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
200 Ton W.F. Hobbing Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press

All Hydraulic Equipment is completely engineered and checked by a competent staff thus assuring reliability.

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This is but a partial listing. Write for free Catalog. Inquiries invited. HUNDREDS OF OTHERS

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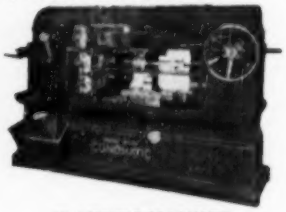
RELIABILITY has been earned by
WIGGLESWORTH MACHINE TOOLS

AUTOMATICS
2⅝" Cone 4 spdle., well equipped, 1936
#24 New Britain 4 spdle. chucker, 2¼" cap.
¼" Model F Gridley, 4 spdle.



2" 4 SPINDLE CONOMATIC

BORING MILLS
#25RT G & L, 2½", rotary table, late
#42 Lucas, 4" bar, table type, late
42" Bullard New Era rail head
60" Bullard, 2 rail heads, all p.f.
No. 40 Landis floor type, 4" bar, rebuilt

GRINDERS
#104 Rivett Universal, 1942, rebuilt
#4 Bryant internal, auto. sizing
#70A Heald plain internal, 1940
No. 5 B & S cylindrical, 3x12" late
#33 Excello ext. groove, late type
#86—30" Gardner vert. disc grinder
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
P & W deep hole drill grinder, late
Model 1311 P & W contour, late

DRILLS
#2LMS Leland Gifford 4 spdle., hand feed
6 17" Carlton radial, DC motor, late
4'11" Western radial, enclosed head
#12 Minster r., #5 M.T., box column
#2LMS Leland-Gifford, 36", hydraulic
#24 Footburt, 3 spdle., #5 M.T., 24"
#2 Allen, 2, 4, 6 spdle., #2 M.T.
#2 Detroit Semi-automatic, horiz.
Type 14 Natco-12 spindle
Model 4230 Bodine Drill & Tapper, 12 sta.
Moline Hole Hog, 2 spindle

GEAR MACHINERY
#13LS Fellows lapper
7A Fellows, shaper high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES
24x102" Reed-Prentice, g.h., quick change
27"x13' LeBlond, g.h., 16 speeds, late
30"x10' American geared head, taper att.
42"x25' American Hvy Dty, 2 carriages, late
48"x35' LeBlond Hvy Dty, taper, late
Hepburn Shell lathe, late
Gisholt Simplimatic, platen type, late
33" Niles vertical wheel lathe, 1930
48" Niles vertical wheel lathe, 1930

TURRET LATHES
#4D P & J auto. high speed, air chuck, late
Libby type H, 24" swing, 8 spdle. speeds
#4 W & S plain, Timken, #327217
#2 Simmons Microspeed, air chuck, late
#3 Morey Universal, 1943, air chuck
#3 Gisholt Universal, late

SHAPERS & PLANERS
30"x30"x17' Cleve. Openside
48x48x14' Detrick & Harvey dble. hsg.
26" Smith & Mills shaper, 4 step cone

MILLS
#5 Cinn. horizontal, Lima drive
#1-14 Kent Owens production, late
#1½B K & T horiz., dble. overarm, rebuilt
Briggs production, hydraulic
10C Van Norman Contour

THREADERS
#50 Excello Precision grinder, 28x68"
TG18S J & L internal grinder, 12 x 15"
13" Automatic Machinery miller, late
Model 40 Lees Bradner mill, 6½" hole
#2 Detzen grinder, 3" o.d. cap., late
LT636 Lees Bradner mill, 18 x 36", late
1½" Landis, 2 spdle., lead screw type

FURNACES
Whiting Converter, 2 ton cap., late
Model 5P Jethe, gas, 1000° F
Lithdraw heat treat, 1200° F, late

PRESSES
50 ton Henry & Wright Dieing
#12 Zeh & Hahnemann precussion, 150 ton
#78½ Bliss straight side, 350 ton, sgle. crank
Ferracute type EG-52 embossing, 150 ton
Lucas 50 ton straightening, 24½" stroke
#57 Toledo, 150 ton, s.s., s.c.
#4 Toledo OBI, 25 ton, 2" stroke

MISCELLANEOUS
SAW: #18 Marvel hack, 18 x 18" late
HAMMER: 4000# Erie Steam, sgle. frame, late
KEYSEATER: #6-38 Mitts & Merrill, 4 x 36"
SPINNING RIVETER: Grant 5 spdle.
HAMMER: 300# Bradley Upright Helve
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZERS: #2 Ajax High Speed, 30 ton

T. R. WIGGLESWORTH MACHINERY COMPANY
1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

FAIR DEALING PRICES FROM FAIRFIELD
A DEALER OF ESTABLISHED REPUTATION

Three Unusual Tools — All Late

6" x 48" Thompson Hydraulic Broach Grinder.

Cleveland 6 Spindle Automatic Chucker, 4¾" capacity.

Leland-Gifford 2LMS 6 Spindle Drill Press with back gears and power feed to all spindles.

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75 SANFORD STREET at R.R. Station Phone FAIRFIELD 9-3321 FAIRFIELD, CONN.

1 LOT TURRET LATHES
(All 1941-3)

(2) Warner & Swasey Model No. 2M50 Capacity 1" Round Collet Hand Scr. Machines Chuckers, Serials No. 556,154 and 556,165 (1942)

(3) Warner & Swasey Models No. 2M7Q Capacity 1" Round Collet Hand Scr. Machines, Bar Feed, Serial Nos. 555,500 and 556,200 (1942)

(3) Mercys Model No. 2G—Timken, Capacity 1" Round Collet Power Fd. to Turret, Bar Feed (1941-42)

(1) Libby (Gisholt) Model No. 3R—Ram Type. Hole in Spindle, 2-3/16", Power to Turret, Chucker, 20" sw. Serial No. 1102 (1942)

Price $25,000 for all 9 machines, F.O.B. Brooklyn.

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MACHINE TOOL REBUILDING
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OSWEGO, N. Y. **PHONE 1763**

LATE MODEL TOOLS
American Type T-8-32 Broaches Three-way vertical hydraulic, single ram, 13"x18" table. Cap. 12,000#. MD with 7½ HP motor. 1942.
Barrett 1 ton Portable Shop Elevator Hinged type. Never used. Half price.
No. 320 "Barnesdrill" Multiple Cyl. Hyd. Hone, throat—19¼", spindle stroke 2" to 20", 8" dia. spindle. Sleeves with #4 taper. 1948.

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new and used machinery

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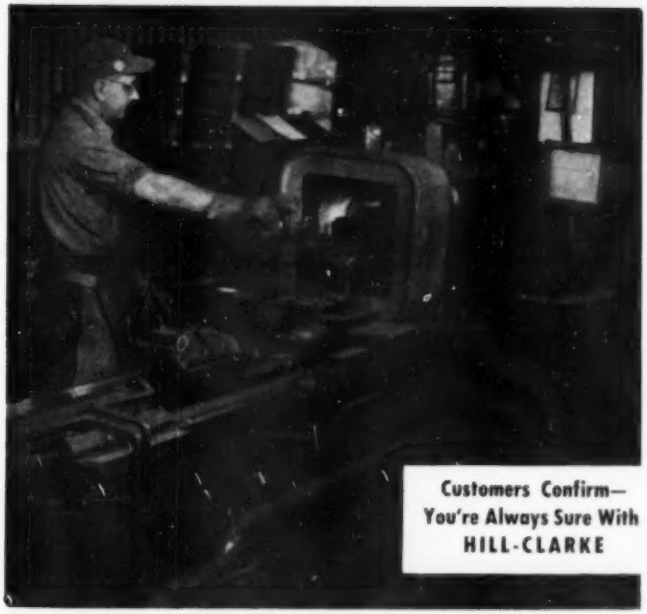


THE MAYTAG COMPANY REPORTS TWO-THIRDS GREATER PRODUCTION, easier operation and less maintenance, required with this Hill-Clarke rebuilt lathe. For 38 years MAYTAG has relied on Hill-Clarke for good, dependable used machines like this recess lathe used to center bottom of washer tub so that agitator has some all around bottom clearance.

MILLING MACHINES

54"x30"x16" Ingersoll Slab Mill
6"x168" Pratt & Whitney Thrd. Mill
16"x48" Hanson-Whitney (1942)
12"x102" Lees Bradner Thrd. Mill

PLANERS

36"x36"x12" Cincinnati, 2 hds.
36"x36"x12" Gray, 2 hds.
42"x42"x10' Cincinnati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
48"x48"x12' Gray Maxi-Service
60"x48"x27' American, 4 hds.

MISCELLANEOUS

6"x6" capacity Marvel Hack Saw
1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
5 Ton Fox Hydraulic Press
2—12"x96" Magnetic Chucks
20"x1" cap Southwark Roll
14'x¾" cap Niles-B-Pond Roll
15" Drill Slotter
18" Drill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper

FULL MONEY-BACK GUARANTEE

1. **Hill-Clarke gives you an unconditional money-back guarantee.**
2. **All machines in stock.**
3. **You can see your machine run and tested under power in our plant before purchasing.**
4. **Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.**
5. **A responsible organization — with 85 years' experience.**

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1 Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—24" Sw—No. 3 Avey
D-41 Fox Multiple Drill, No. 2 Taper.
6' Western Radial

GEAR MACHINES

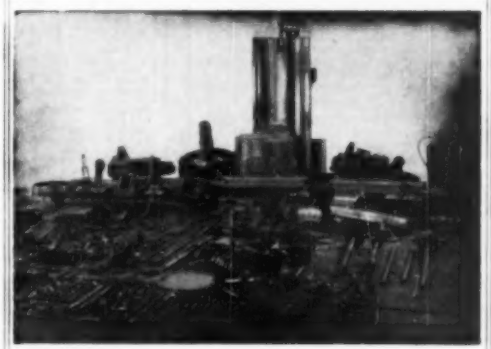
No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

LATHES

12"x21" Fay Automatic
19"x8' LeBlond Hvy. Duty Lathe
36"x18' Putnam Grd. Bd., M.D.
No. 4R Libby Turret (1942)
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt
No. 4A Warner & Swasey—7½" Hole—Spdl.

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
18"x96" centers
18"-50" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. 4—12"x60" B&S Univ. Gd.
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless



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NOLL LATE TYPE REBUILT MACHINE TOOLS

AUTOMATICS
Conc 4-Spindle 1½" Vertical Cut-Off (Latest)
Goss & DeLeeuw 8"—5 Sp. Work Rotat'g (Late)
New Britain 6-Spindle 1", #60 Complete Motors Stock Reel Chip Conveyor (Late)
New Britain 6-Spindle 1⅝" x 7" Model #205

BROACHES
American 30 Ton 40" Stroke Vertical Single Ram Pull Up 25 hp 220-440 (Late)
Colonial 1 Ton 12" Stroke Model VJ-1-12
Oilgear 5 Ton 36" Stroke Horizontal

BORING MILLS
Bullard 6" Multamatic 6-Spindle Type A
Bullard 36" Vertical Side Head Spiral Drive
Fisher #5—40—60 Horiz. Table Type 5" Bar (Late)
King 42" Vertical 2 Ram Heads (Swivel Type)

DRILLS & RADIALS
Baker 3 Sp. Drill Head #10 HH Horiz. (1938)
LoLand Gifford 5-S 1LMS (Late)
Natco 20 Spindle Head ¼" Capacity
Natco 2AL (Latest)

GEAR EQUIPMENT
Barber-Coleman #3 Serrator Gear Hobber
Brown & Sharpe #6—60 Gear Cutter
Gleason 3 Sp. Straight Bevel Gear Rougher (Late)

GRINDERS
Arter 8" Rotary Surface Grinder
Arter 16" Model A3 (Late)
Brown & Sharpe #2—18" x 6⅛" Bed
Bryant #12 Flange Type Work Spindle
Bryant Internal Gr. Mod.el 16F28 (Latest)
Cincinnati Valve Seat Grinder
Cincinnati 10" x 18" Hydraulic (1948)
Heald #72A3 Sizematic Internal
Heald #72A5 Plain Extended Bridge, Internal (Latest)
Landis 6" x 18" Plain Hydraulic Type "C"
Landis 6" x 20" Plain Hydraulic Type "A"
Landis 30" x 72" Hydraulic Type "C"
Lobdell 30" x 160" Roll Grinder Model #3GH

LATHES
American Engine 24" x 10' Geared Head Taper Attach't
Betts-Bridgeford 36" x 8' B.C. with Duplicating Attach. 41" over ways 22" over cross slide (Late)
Bridgeford 68" x 20' B.C. G.H.
Lehmann 22" x 72" T.A. 24" Swing (Late) Eng. Lathe
Monarch 18" x 30", 19" Swing 1½" Hole through Sp.
Acme Turret Hollow Hex 2¼" Hole in Sp. 21" Swing
Gisholt 6¼ (Tilted) Turret
Pond 42" x 8' B.C. 30 hp Motor
Lodge & Shipley 21" x 63"—#3A Duomatic

MILLS
Auto. 16" x 20" Univ. Hob Thread Mill (Latest)
Brown & Sharpe #12, #50 M.T. (Late)
Brown & Sharpe #3A Universal Horizontal
Brown & Sharpe #4A Universal
Cincinnati #0-8 Vertical (Latest)
Cincinnati 24" Duplex Table 35½" x 8"
Cincinnati Duplex 45-48, 60" Travel—Prod.
DeVlieg #31 Prod. Table 16" x 66"-48" Travel
Ingersoll 28" x 33" Table Horiz. Slab Mill
Ingersoll 36" Drum Type, 36" between Centers

PLANERS
Betts 84" x 60" x 16' Dble. Housing—Four Hd.
Gray 24" x 24" x 72"
Rockford 36" x 36" x 10' One Head on cross rail and one head on each side of table

PRESSES
Bliss #7 O.B.I.
Chambersburg 50 Ton Hydraulic
Hydraulic 100 Ton Horizontal
Toledo 15 Ton #41 Hoarng & Wir'g. 1½" Stroke
Toledo 90 Ton #82C Double Crank Back Geared 2" Str.

SHEARS
Columbia 10' x 3/16", 5 hp 220-440—2 sets Blades Micro Back Gauge (1948)
Hill & Jones 1½" Bar Iron

MISCELLANEOUS
Lepel Furnace 30 KW (Late)
Tocco 200 KW Induction Heating Unit
Westinghouse 22 KW Lead Bath Type J Furnace
Nazel #38 for 4" Squares Equiv't to 400# Steam Hammer

Phone Express 1-0700
NOLL EQUIPMENT CO.
4537 ST. CLAIR AVE.
CLEVELAND 3, OHIO

BORING MILLS
No. 0 G&L Horizontal Boring, Drilling and Milling Machine
No. 32 LUCAS Horizontal Boring, Drilling and Milling Machines
36" BULLARD Vertical Turret Lathe
100" BETTS Vertical Boring Mill, Late

DRILLS
3-9" CINCINNATI BICKFORD Hi Spd Radial, '41
32" CINCINNATI BICKFORD Upright Drill
No. 65 ATCO Multi Spindle Drills—Hyd. table, '42
No. 425 BAKER S.S. Heavy Duty Drill
No. 2BS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT
Nos. 64, 72 & 725A FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1941
No. 36BM GOULD & EBERHARDT Gear Rougher

GRINDERS
No. 5 B&S 3"x12" Plain Grinder
6"x18" CINCINNATI Plain Hyd. Cyl.—Filmatic
6"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vertical Spindle Surface Grinder
10"x24" LANDIS Universal Grinder
16"x72" LANDIS Type C Hyd. Pl. Grinder—'42
14"x46" CINCINNATI Plain Grinder, Filmatic, Late
No. 104 RIVETT Internal-External Grinder
No. 75 HEALD Internal Centerless Grinders
No. 172 HEALD Internal Grinder

LATHES
14"x6' HENDEY Model ECM M.D. Engine Lathe
16"x30" LODGE & SHIPLEY Toolroom Lathe, '41
20"x10' LODGE & SHIPLEY Selective Geared Head
27"x14' cc LEBLOND HD Engine Lathe, '42
30"x16' bed AMERICAN "High Duty" Geared Hd.
36"x19' bed AMERICAN HD Lathe
42"x15' AMERICAN Geared Head Lathe
42"x25' cc AMERICAN "Super Productive" GH Lathe—two carriages

MILLERS
Nos. 0-8 CINCINNATI Plain & Vert. Milling Mach.
Nos. 1-0 & 1-14 KENT OWENS M.D. Production Millers
Model MM-5 U.S. Multi-Miller
No. 2 B&S Pl. Light Type Miller
No. 2W CINCINNATI Vertical Miller 1941
18" CINCINNATI Mfg. Knee Type Milling Mach.
4½x36" P&W Model C Thread Miller
36"x36"x16' INGERSOLL Planer Type, 3 heads
18"x30"x12' INGERSOLL Planer Type, 3 heads, Late

AUTO LATHES & TURRETS
No. 2 B&S Wire Feed Hand Screw Machine
No. 2 W&S Geared Friction Hd. Turret Lathe
No. 3A W & S Univ. Hyy. Dty. Saddle Type Thr. Lathe
No. 3 J&L Ram Type Universal Turret Lathe
No. 1145 LIBBY Heavy Duty Turret Lathe
No. 6L GISHOLT Saddle Type Turret Lathe, 1947
Nos. 4D & 6S POTTER & JOHNSTON Auto.

WIGGLESWORTH INDUSTRIAL CORP.
203 BENT ST. CAMBRIDGE 41, MASS. KIRKLAND 7-5242

McDONALD
USED MACHINERY

Landis 20"x72" and 18"x96" Plain Ext. Grinders.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W. & S. No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp.
LeBlond 27"x12' Bed Grd. Hd. G.C.G. Lathe 13" hollow spindle.
Norton 6x18" Horiz. Hand Surf. Grinder 1941.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
20" All Grd. Camel Back Drill 1-Sp. and Barnes.
Amer. 5' & Morris 3¼" Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf. Grinder 20" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1947.
Nazel #3-B Vert. Air Hammer A.C. M.D.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed G.C.G. Lathe 1939.
W & S No. 4 Hd. Turret Lathe
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Masimiller M.D.
Heald #70-A Rod Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
P & J #2-M Auto. Prod. Miller, 2 Tables.
Foote-Burt #23 Box. Col. 1-Sp. Hvy. Drill.
L & N, 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 20" stroke openside Shaper Planer.

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McDONALD MACHINERY CO.
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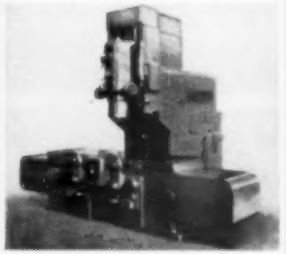
FOR SALE
TWO REED-PRENTICE NO. 4 VERTICAL MILLERS
One Rebuilt — One Good Condition



Standard Equipment with Sundstrand Hydraulic Feed Mechanism

Specifications	
Longitudinal travel of table	48
Table working surface (overall)	24x84
Travel of cross slide	24
Vertical travel of head	12
Top of table to spindle nose — Max	24
Min	12
Throat distance	33
Top table to underside of cross slide ways	19¼
National standard spindle nose	#50
Number of spindle speeds	16
Speed range	30-1200 RPM
Number of feeds	Infinitely variable
Feed range	1-32" per minute
Power rapid traverse	180" per minute
Motors — Spindle drive — 20 H. P. 1200 RPM 550-60-3	
Feed drive — 5 H. P. 1800 RPM 550-60-3	

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7½" Hole in Spindle
Both Machines Motorized and in fine condition
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High grade late type machine.
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FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
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ALLEN: #2 High Speed, 15" overhang
CINCINNATI-BICKFORD: 1¼" upright
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

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CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
GOULD & EBERHARDT 96", Universal, motor-driven
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SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

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GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

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FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
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LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

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BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

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VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers

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MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

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SWISS #5B Jig Borer
LINDNER #14 & #15 Jig Borer, new

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RICE-BARTON: Duplex Spline
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LOGAN: 5-Ton Vertical Hydraulic Press
5-TON Vertical Hydaulic Press

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MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

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KLOPP: 16" to 26½" Shapers (New)

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LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

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HEENAN & FROUDE: Wire forming, 4-slide machines (new)

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RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
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PRESS: Screw. Gen. Flex. 3 ton
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25"-32"x96" centers AMERICAN Pacemaker Heavy Duty Engine Lathe, taper attachment, chucks, 25 HP AC motor, new 1948.

28"x15' centers BERTRAM (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC MD, new 1943.

60"x20' NILES BEMENT POND Geared Head Engine Lathe, rapid traverse.

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No. 5 GISHOLT Universal Turret Lathe, preselector head, bar & chuck, new 1943.

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No. 2 VAN NORMAN Plain Mill, motor in base, new 1942.

No. 4 KEARNEY & TRECKER Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse.

5'-13" column CARLTON Radial Drill, AC motor in arm, 15-1500 RPM, box table.

No. 914 BAKER Heavy Duty Hydraulic Drill, No. 6 Morse taper, 15 HP motor, new 1946.

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1—Landis Hydr. Internal Grinder 15x8
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BORING MILL, 72" King, 2 Hds., P.R.T., M.D.
BORING MILL, 72" N.B.P., 2 Hds., P.R.T., M.D.
BORING MILL, 3½" bar Defiance, Table Type
BORING MILL, 3½" bar Giddings & Lewis #9
BORING MILL, 3" bar Lucas, Table Type
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6' Amer., 15" col. Trip. Purp., 2 Arm
5' Amer., 15" col. Trip. Purp., 1 Arm
5' Amer., 14" col., Trip. Purp.
5' Niles #10 Rightline, Univ., Motor on arm
4'11" col. Cinci. Bickford
3'6" & 2½' Arbega (Swedish), Late
TABLES, RADIAL, 36"x20"x20"
DRILLS, #80 Calibre 3/8", 5" capty.
#314 Baker, 24", 3" capty.
24" Cinci. Bick., Tapping, M.D.
#2L MS Leland G/Ford, Deep Hole
FLANGERS, ¾" and 1½" McCabe (2)
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GEAR CUTTER, No. 13 B. & S. Spur & Bevel
GEAR SHAPERS, No. 75, Fellows
Nos. 5, 61A, 64 & 64A Fellows
11" Rienecker, Bevel
GRINDER, SURFACE, #16 Blanchard, 10" chuck
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, 4"x18" Landis #4H, Cylindrical, Late
GRINDER, No. 6T Sellers Tool, 1942
GRINDER, Micro Internal, large capty.
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
KEYSEATER, No. 3½ Baker, 24" str. x 4" wide
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48"x20' bed, Amer. T.A., Grd. Hd.
32"x14' bed Schumacher Boye T.A., M.D.
20"-46"x16' bed Rahn Larmen, Gap
26"-48"x24' bed McCabe Dble. Spin., M.D.
26"x12" Bridgeford, GCG, Grd. Hd., M.D. (2)
24"x12" bed B. & E., T.A., Grd. Hd.
20"x78" Matra, T.A., New
18"x10' bed L. & S., T.A., Cone Motorized
16"x8' bed L. & S. Selective Grd. Hd., M.D.
16"x60" cen. P. & W. Motor-in-base
16"-32"x8' Harrington Gap M.D.
16"x6' & 12"x6' Hendeys (2)
14"x6' bed Amer. T.A., M-in-base
TURRET LATHES, No. 3A Warner & Swasey, 1943
No. 5AL Gisholt, 6¼" H.S.
No. 3 Gisholt, 1942
No. 2B Foster Univ., 3¼" Capty., Bar Timken
No. 1B Foster Univ., 2" capty., M.D.
21" Acme Universal Brass, Late
16" Libby Model A Grd. Hd.
MILLER, No. 22L Van Norman, Late
MILLER, No. 4 Cinci. Univ., Hi Power, M.D.
MILLER, No. 3 Cinci. Hi Power, Motorized
MILLERS, Nos. 2 & 3 Cinci. Hi Power Univ., M.D.
MILLER, No. 2 Stand. K. & T. Univ., #50
MILLER, No. 2 Van Norman Rem. M.D.
MILLERS, No. 2 Series (like Van Norman) New
MILLER, No. 1½B K. & T. Univ., Grd. Hd.
MILLER, No. 000 B. & S. Plain, M.D., Late
MILLER, No. 0 Sundstrand Rigidmil, Hand
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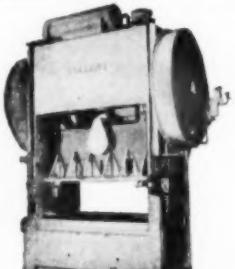

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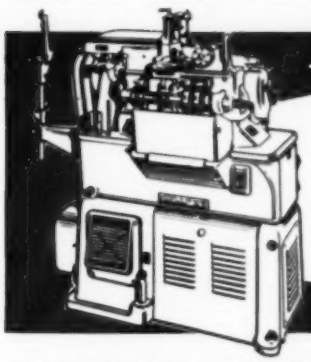

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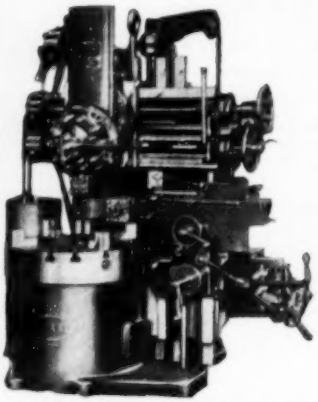

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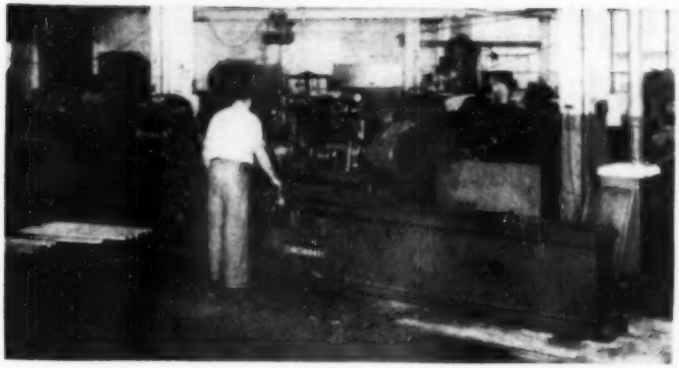

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DENVER No. 6-2, Ser. #A483511, Late
2—GISHOLT No. 5
LIBBY No. H-5
WARNER & SWASEY No. 1A, Pro., 1942
WARNER & SWASEY No. 2A, Pro., 1942
GISHOLT No. 3B
GISHOLT No. 3L, Taper attch., BF, Cross slide turrets, 1936
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GIDDINGS & LEWIS No. 30, 3", Horiz. with 2 Aux., Ser. #4806
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BULLARD 36" Vert., Ser. #6138
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CINCINNATI No. 2MH, Plain
SAIMP No. 2, Vertical, New
KEARNEY & TRECKER No. 2, Vertical, 1931
INGERSOLL Duplex, 24" x 36", 1942
OHIO No. 1236, Production
CINCINNATI No. 4-48 Production

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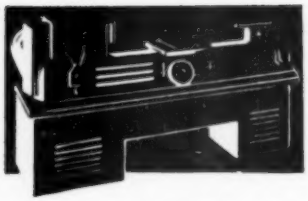

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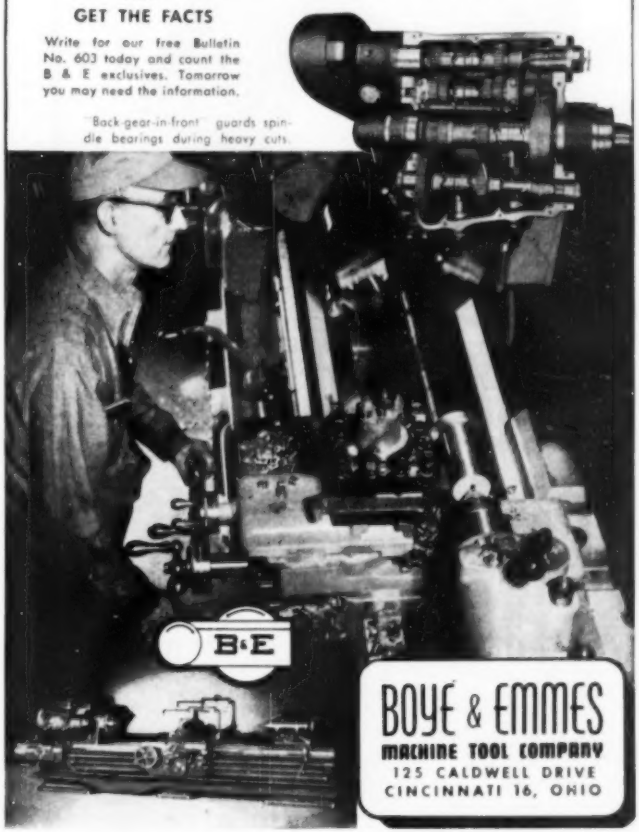

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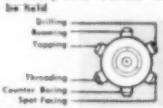

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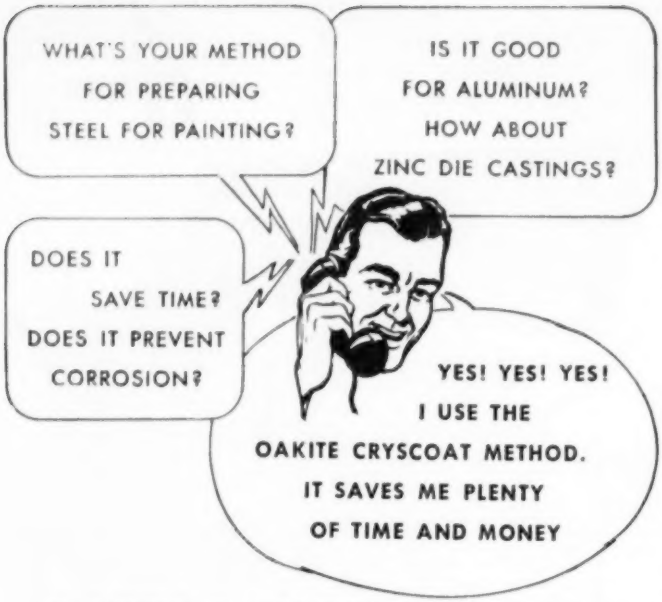
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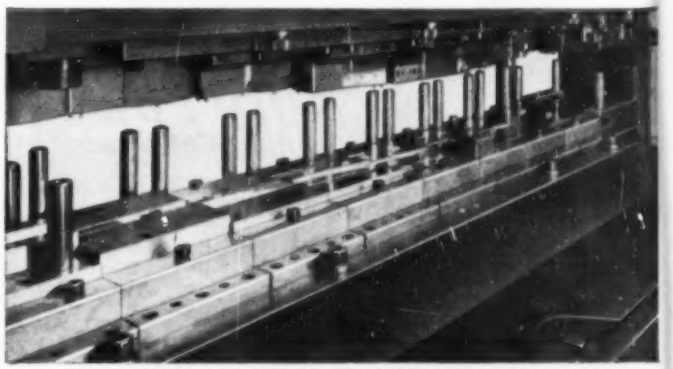
B. Jahn PRODUCTION PROVED DIES

speed carbine magazines from—

Production line to Battle line

with new efficiency and economy!

Another evidence of B. Jahn versatility and ingenuity is this mammoth progressive die — one of the largest of its kind ever built! Measuring over six feet in length, this vital defense tool produces *40* carbine magazines per minute — each identical! Each perfect! Each an example of flawless "proving ground" accuracy!



CARBINE DIE "SET UP" FOR PRODUCTION RUN

CARBINE DIE RIBBON SUBMITTED FOR CUSTOMER APPROVAL

THIS — LIKE EVERY B. JAHN BUILT DIE — WAS PRODUCTION PROVED TO ELIMINATE ALL ERROR, ALL CHANCE, ALL UNCERTAINTY AND TO GUARANTEE A FINER DIE PRODUCT!

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SEND TODAY for the "Story of B. Jahn PRODUCTION PROVED DIES!"

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B. Jahn

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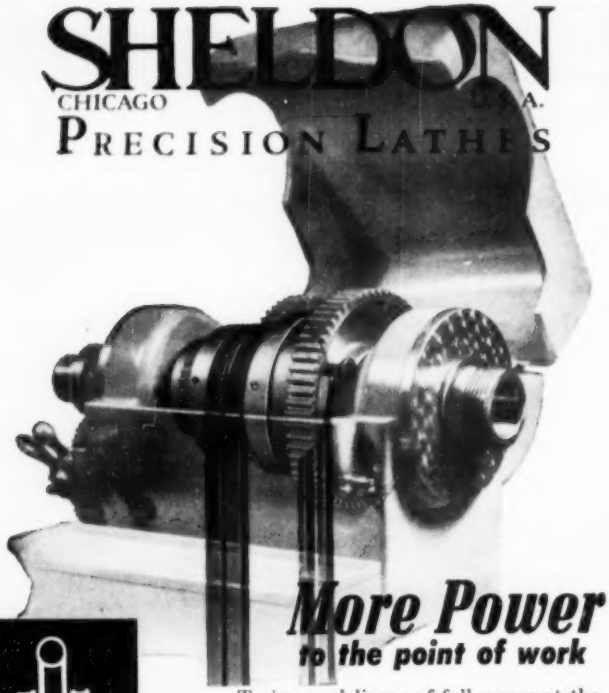
SHELDON

CHICAGO U. S. A.

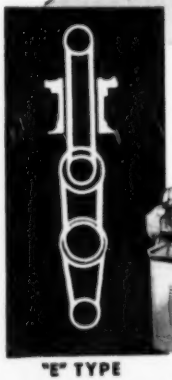
PRECISION LATHES



More Power
to the point of work

To insure delivery of full power at the point of work . . . to prevent slippage on heavy cuts, the underneath motor drives of SHELDON Precision Lathes have double V-Belts driving the spindle. Tandem V-Belts, each of which engages the spindle around a full 50% of its circumference.

You will note a feature of SHELDON underneath motor drives not common to other moderate priced lathes is the extra, underneath counter shaft that permits driving thru a *standard* 1-piece lathe bed. There is no cutting away of the bed for belt clearance, nor use of "spliced" beds, in SHELDON Precision Lathes.



"E" TYPE

Completely enclosed in the cabinet leg, the the SHELDON Type "E" Underneath Motor Drive has matching 4-step, V-Belt sheaves which provide 4 speeds (8 spindle speeds). All belts are provided with individual means for permanent adjustment of tension.

"U" TYPE

With a SHELDON Type "U" Underneath Motor Drive, all speed changes are instant—are made by clutches operated by levers that are conveniently located outside the enclosed cabinet leg. 4-speeds (8 spindle speeds) and individual belt tensioning means are provided.

Write for Catalog

SHELDON MACHINE CO., INC.

4234 North Knox Ave., Chicago 41, Illinois

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DOING ONE THING AND DOING IT *BEST*

- *for accurate, very fast precision finishing of internal bores*

BEST AND QUICKEST method on ferrous and non-ferrous metals, glass, plastic etc. **BECAUSE** excellent results are obtained wherever fine finishes and accurate holes are required. Tolerances to .0001 (±).

REDUCE PRODUCTION TIME . . . IMPROVE QUALITY

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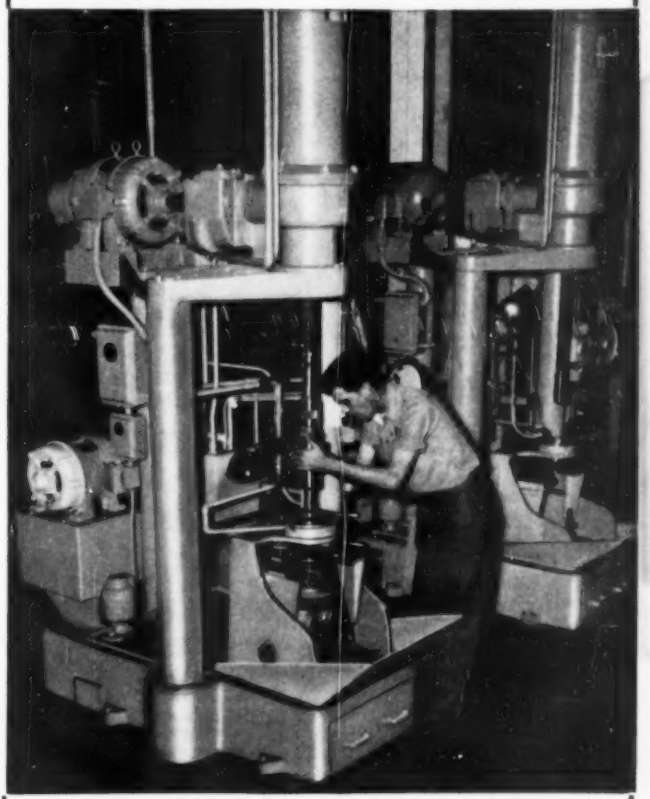

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Now you can get up to six times more production from taps used in your plant. This amazing increase in tap performance is made possible by a proven method of precision tap sharpening.

PRECISION TAP SHARPENING EXPLAINED

Precision sharpening consists of accurately grinding each tap to provide for uniform spacing of cutting edges, accurate hook angle on each cutting edge, and concentric chamfers. It makes possible an exact duplication of a previous grind.

THE BLAKE METHOD OF TAP SHARPENING

The only combination of machines on the market today which allows you to sharpen taps with this high degree of preciseness is the Blake Flute Grinder and the Blake Tap Chamfer Grinder. These two machines, used in conjunction with each other, enable you to get greatly increased production from your taps. They also help reduce tap breakage and increase effective tap life six times or more.

PRECISION SHARPENING IN OPERATION!

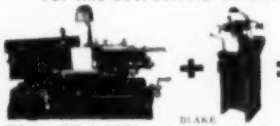
A ¾"-24 four-fluted tap is ground accurately on chamfer with the No. 1 Blake Tap Chamfer Grinder.

SEND FOR COMPLETE INFORMATION

To get additional information on this subject, write to us for your free copy of the *Machinery* article, "Why Taps Should Be Sharpened Precisely". Technical details about both Blake tap sharpening machines are available in illustrated folders listed below. Ask for them!

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!



BLAKE CHAMFER GRINDER (Described in Bulletin 551) BLAKE FLUTE GRINDER (Described in Bulletin 653)

ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS

Write for details about both machines!

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FOR *Strictly* IMPERSONAL INSPECTION CHOOSE AMES DIAL COMPARATORS

Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy – the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

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Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.

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Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

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Series T-1

Final authority on precision work

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These "Feather Touch" micrometers retain absolute accuracy indefinitely. Engineered tubular design is less susceptible to shock—two-point wear take-up maintains the original precision.

For final, authoritative checking in plant or laboratory, you can't beat Tumico's Series "T" Micrometers—available now in capacities from 0" to 30", plain or carbide tipped anvils and spindles.

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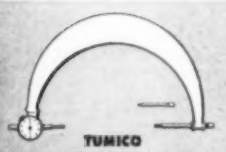
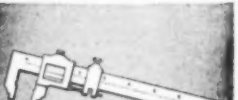
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".



TUMICO DIAL INDICATOR GAGES
Quick vision Tumico micrometers and gages to meet your special measurement requirements.

TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.



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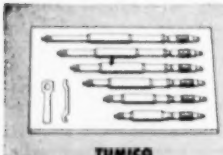

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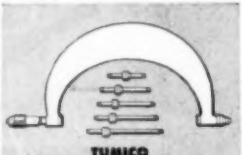

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Precision bore measurement without removing boring bar. 11 models from 3" to 28".

TUMICO COMBINATION SETS
Square, Gage, Center Finder, Protractor, Scriber, Level, Rule, Straight Edge. Handy and useful.

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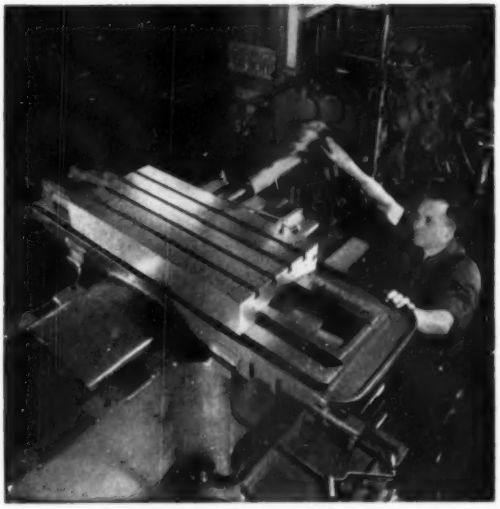

Five sides of workpiece mounted on Gilbert Universal Table (*upper right*) are drilled and tapped on a Gilbert Radial . . . Jig borer base assembly on Gilbert Table Type Horizontal Boring Mill (*above*) is lined up for final machining, and (right) four 8½" diameter holes and one 16½" hole are bored in die set on Gilbert Table Type Horizontal Boring Mill, using stub boring bars.

Final proof of Gilbert performance rests in the simple fact that Gilbert customers keep coming back for more. Here are just three out of nineteen carefully documented Gilbert job studies presented in "Performance Counts" Bulletin 1049. Write for it today.

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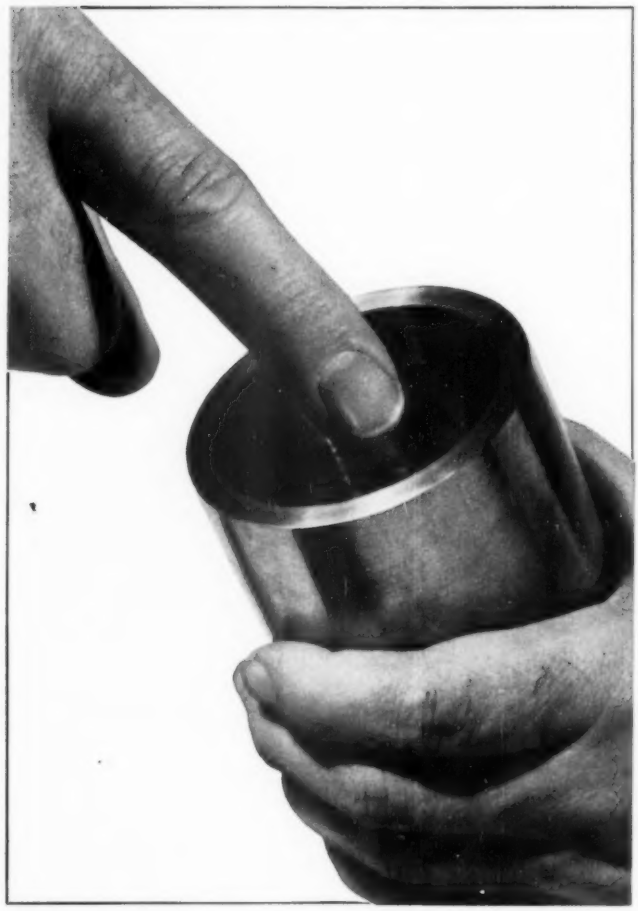
3366 BEEKMAN STREET • CINCINNATI 23, OHIO

Save steel and machining time– let us do the hole job



THE center hole's already in Timken® seamless steel tubing. Less metal to machine away saves machining time and gives you more parts per ton of steel.

Finish boring is often the first step, releasing screw machine stations for other operations and providing greater machine capacity without adding costly machines.

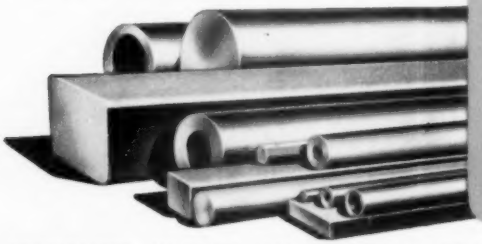
And by using the Timken Company's tube engineering service, you can save even more steel. Our engineers will study your problem and recommend the most economical tube size for your job, guaranteed to clean up to your dimensions.

Since the piercing process used to make Timken tubing is basically a forging operation, it produces uniform spiral grain flow and refined grain structure. You're sure of fine forged quality in your product.

And the Timken Company's rigid quality control insures uniformity from tube to tube and from heat to heat.

For more information about the use of Timken seamless tubing, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



TIMKEN
TRADE-MARK REG. U.S. PAT. OFF.
Fine Alloy
STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING